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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Twenty-third Annual Meeting, American Gas Light Association.

OFFICE OF THE SECRETARY, P. O. Box 1160,
PROVIDENCE, R. I., September 21st, 1895.

The 23d annual meeting of the American Gas Light Association will be held in Philadelphia, Pa., on October 16th, 17th and 18th, 1895.

The meeting will be called to order by the President, Walton Clark, of Philadelphia, Pa., at 9:30 o'clock, A.M., on October 16th, in the meeting hall at the headquarters, Continental Hotel, which is located on Chestnut street, corner of 9th.

The Continental is conveniently reached by the principal street car lines, as are the other first-class hotels in its vicinity. As the most satisfactory quarters are always obtained by writing in advance to the hotel people, the following list of hotels is appended, and it is particularly suggested that in writing to them a reply be requested, for which a self-addressed and stamped envelope should be inclosed, as misunderstandings and disappointments may thereby be averted. Remember: "First come, first served."

Hotel.	*Rates.*	*Distance from Headquarters.*	*Location.*
Continental (American plan). (Special rates to those attending the Convention....	4th, 5th and 6th floors .. $3.25 3d floor ... 3.00 2d and 1st. 4.00 Rooms with Baths, extra.	This is the Headquarters.	Cor. of 9th and Chestnut streets.
Girard	.....	Directly opposite.	On Chestnut street.
Bellevue (European plan) ...	$2.00 and upwards.	6 blocks.	Broad and Walnut sts.
Stratford (European plan) ..	$2.00 and upwards.	6 blocks.	Broad and Walnut sts.
Metropole (European plan)..	$1.50 and upwards.	7 blocks.	Broad and Locust sts.
Colonnade (European plan).	$1.50 and upwards.	6 blocks.	15th and Chestnut sts.
" (American plan)	$3.50 and upwards.	"	" "
Bingham (American plan)..	$2.50 and upwards.	8 blocks.	11th and Market sts.

The meeting hall had to be changed, as the original plan for the headquarters and hall could not be carried out, owing to the failure of the large hotels uptown to complete their house alterations in time for the convention. By special arrangements with the Continental it was made possible for the meeting to be held there, with the Ladies' Ordinary as the meeting hall; thus the sessions will be held at the headquarters.

Reduced rates for transportation have been secured. The final arrangements will be fully explained in a later circular of detailed information..

The Roll Call will be made by means of an improved system of door cards, and be in charge of one of the Committee of Arrangements. Each member or visitor upon entering the hall for the first time will at the door receive a special card upon which he will find his name, address, etc., the card then to be given to the doorkeeper after correcting any errors on it. Visitors will please hand to the doorkeeper their personal cards.

Blank forms for application for membership will be found among the last pages of several issues of the *Quarterly Proceedings*, and may also be had, with full information, by addressing the Secretary.

Applications for membership must be indorsed by two active members and be received by the Secretary on or before October 5th, as if received later than that they cannot be constitutionally acted upon at this next meeting.

The list of papers to be read at the meeting is as follows:

"The Creation of a Healthy Public Sentiment Toward the Gas Company in the Locality in which it Operates," by Mr. W. H. Rogers, Paterson, N. J.

"Retort House Design and Practice," by Mr. A. E. Forstall, Newark, N. J.

"Notes on the Storage of Oil at Gas Works," by Mr. Frederic Egner, Norfolk, Va.

"The Ventilation of Gas Lighted Rooms," by Mr. Irvin Butterworth, Columbus, O.

"Bench Firing with Soft Coal," by Mr. E. G. Pratt, Des Moines, Ia.

In addition to these there will be, in the latter part of Wednesday afternoon, an illustrated lecture on Acetylene, by Mr. W. W. Goodwin, of Philadelphia, Pa.

Members are expected to send in not only papers on original subjects, but also written discussions or analyses of any or all of the papers written by others, such written discussions to appear in the next issue of the *Quarterly*.

Questions for the Question Box should be sent to the Secretary as early as possible, as each one will be referred to some member, who will lead discussion on it, and so it is very desirable that sufficient time be given for proper investigation of the subjects.

The Committee of Arrangements are completing their programme, all of the details of which are not absolutely settled; the Secretary, however, is allowed to say that it is expected to make the general programme as follows: On Wednesday forenoon, business session; Wednesday afternoon, business session, including illustrated lecture by Mr. Goodwin; Wednesday evening, it is expected to hold an informal reception at the headquarters. Thursday forenoon, business ses-

sion, extending to probably 2 o'clock. Thursday afternoon the meeting will, by special invitation, adjourn to the works of the Welsbach factories at Gloucester City, going by boat, for an inspection of the plant and a most elaborate display of incandescent illumination in the evening. A dinner will be served on the grounds, a special pavilion being erected for the purpose. Friday, the Association will go to Atlantic City by special train, returning same afternoon. The ladies will be well cared for, as usual. Meet each other Wednesday forenoon, gossip and shop rest of the day; reception in the evening. Thursday, drives and gossip; theater parties in the evening. Friday, trip to Atlantic City.

During the days of the meeting bulletin boards will be posted in the lobby of the headquarters and in the meeting hall. All members are warned to take due notice thereof and govern themselves accordingly, that they may be apprised of any change in or addition to the programme.

Many of the members have allowed their dues to remain yet unpaid, and this is a source of much difficulty and extra work to the Treasurer, who has already sent several statements to each of the delinquent ones, as you must know if you are one of them, unless you have failed to notify him of change of address.

Respectfully, A. B. Slater, Jr., Secretary.

BRIEFLY TOLD.

Some Clever Work in Connection with the Coming Meeting of the American Association.—That President Clark, Secretary Slater and the Committee of Arrangements for the October meeting, in Philadelphia, of the American Association, have had on their thinking caps to some purpose, is forcibly shown in Secretary Slater's current circular, printed just ahead of this comment. As we understand the situation, it was originally hoped to have the headquarters in the Lafayette; for although the proprietors of that well-appointed hostelry, at the time the original conference between them and the representatives of the Association was had, were busy directing an extensive scheme of enlargement and renovation on their house, they fully expected that all would be in readiness for the Association when the meeting days were at hand. Accepting the opinion of the proprietors as settling the question, the Association's executives paid no more attention to that part of the preliminaries, but early this month the Lafayette folks said they would not be able to have their house in readiness in time, which notification put the Association's representatives in a quandary and also on their mettle. The matter had a happy ending, however, in that the proprietors of the Continental Hotel were persuaded to grant the Association the use of the "Ladies' Ordinary" as a convention hall, and so the headquarters and sessions rooms are under one roof. The hotel is right in the heart of the city, and it is a comfortable house in which to dwell. That the Committee of Arrangements have also been busy in other directions is shown in the outlines of the scheme for entertainment, that programme being full of promise. The technical part of the meeting, we notice, is to be marked by a lecture on Acetylene, the lecturer to be Mr. W. W. Goodwin, who has given much attention to the possibilities inherent in calcic carbide. We might also say that the system this year for roll call is out of the beaten track, and if it is adhered to as it should be, no confusion in obtaining an accurate roster of those present either as delegates or visitors can result.

A Misstatement Corrected.—In the editorial "Notes," in our issue for September 2d, last, p. 366, second column, the following is printed: "The Hillsdale (Mich.) Gas Company has been put in charge of a receiver, because of a default in payment of interest on its mortgage bonds." While we do not like to have to admit that we misstated the case, it is nevertheless true that we were in error, and it is with satisfaction that we make the *amende honorable*. We should have said that an application for a receiver on the grounds alleged was made, and we also should have said that the application for such receivership was denied. A concise statement of the Hillsdale affair is like this: The present owners of the Hillsdale Company (of whom Mr. G. W. Lloyd, of Detroit, is the head) issued $25,000 bonds, on April 2, 1894, which bonds were not negotiated. Desiring to place the same on the market, and to prevent such action, pending payment of a note given to Mr. F. W. Stock (amounting to $10,000, and not due until December 21, 1895, said note representing the balance due Stock on account of purchase price of the Hillsdale works), the latter claimed that the past coupons on the bonds were due, and being unpaid, he asked for a receiver on such account. On hearing his claims for a receiver the court dismissed the application on the ground that no cause for action had been shown.

Some Experiences in Gas Purification.

[A paper read by Mr. R. G. Shadbolt, of Low Moor, before the Manchester District Institution of Gas Engineers.]

In these times of strict economy and searching analysis, any method, simple or complex, which will enable the manufacturer to reduce the prime cost of his wares, be they in the gaseous, liquid or solid form, is as a rule readily welcomed. Needless to say this is a rule which predominates the commercial world, and one to which we, as a body of manufacturers, are certainly no exception.

There are many things to engage the attention of greater magnitude and apparent importance than the reduction of the labor cost of gas purification by a fraction of a penny per 1,000 cubic feet; but it does not logically follow that it should be neglected on that account. The ordinary duties of a gas manager may be said to consist of a host of small things, few of which have a greater fascination for him than the purification of gas in closed vessels; and although one may not claim to have achieved this in its entirety, still a step in the right direction, however small, is sure to be of interest and benefit to those concerned. Therefore, at the invitation of our Committee, the writer purposes recounting some experiences in gas purification, more particularly respecting the use of air and steam as aids to the work.

It will be some eight years or so ago since we commenced experimenting at Fleetwood (being then with my father) in the use of air in gas purification. The purifiers were three in number, and getting rather small for their work. Two were used in the ordinary way—being charged alternately, and the remaining one was used as a check or catch box. Being unprotected from the weather, the work of emptying and recharging was not always of the most pleasant character; nor were the circumstances such as would conduce to the best working results. It was therefore with a view to reducing the one and increasing the other that attention was turned in this direction.

Operations were commenced by introducing atmospheric air into the gas at the foul main—immediately before the condensers; drawing it in in the orthodox fashion by setting the exhauster governor to give a slight pull. At first, all seemed to go well, for, contrary to expectations, not only were the purifiers beneficially affected, but an actual and appreciable increase took place in the illuminating power of the gas. But, alas! this state of affairs was very short lived; for, when once the coating of naphthaline, etc., on the inner side of the pipes and connections of the different apparatus had disappeared, and all became practically clean, our troubles began.

Naturally enough, an attempt was made to determine the requisite proportion of air to revivify the oxide of iron (this being the principal purifying material) without removal, and whilst in action. But there was no escaping the fact that the cost of enrichment required to counteract the ill effects of the resultant nitrogen upon the illuminating power of the gas, would be far in excess of the saving effected in purifying labor.

The next step was to ascertain, if possible, what proportion of air the gas actually would take without increasing the cost for enrichment—thereby securing the greatest advantage possible from the partial, instead of complete revivification of the oxide whilst in action. But very soon another drawback presented itself. Drawing in air by means of the exhauster appears quite feasible in theory, but, when put into practice, it is another thing entirely. It had become quite evident by this time that 1 per cent. of air was all the "watering" the gas would stand; but though this proportion was very carefully measured and checked, sudden and perplexing variations in the illuminating power of the gas were noticeable—these variations generally being on the "down grade." A little investigation clearly showed this to be attributable to the vagaries of the exhauster governor, which, although every care was taken to measure the air introduced at one particular point, often brought about the wholesale introduction of air at other places—to say nothing of furnace gases drawn in from the settings through cracks in the retorts. Then, again, the exhauster was of the steam jet type, and by setting the governor to give a pull, an increased quantity of steam was required—reducing the strength of the ammoniacal liquor, which was sufficiently weak already.

Suffice it to say, this method of introducing air was abandoned; but after a short respite another was determined upon. This time the governor was set to give a level gauge, and the air introduced at the exhauster inlet—the point of least resistance—by means of a power meter. In this case, much more success was attained than in the other. The strength of the ammoniacal liquor was not unduly affected, a much more regular illuminating power was maintained, and the life of the purifier charges considerably extended. But, although a regular meth-

od of working was soon attained, it was not for very long, for, after changing the boxes once, we were again compelled to discontinue the use of air, owing to the caking of the oxide, with all its attendant disadvantages.

Some 3½ years ago the scene of action was changed from Fleetwood to Low Moor; and it may not be considered out of place to briefly describe some of the apparatus found there. Considerable alterations and extensions had been carried out—including, amongst other things, four new purifiers each 20 feet square by 5 feet deep; and two catch or check boxes each 17 feet 6 inches by 11 feet by 5 feet deep. The latter were constructed from four old purifiers replaced. The condensing and scrubbing plant was totally inadequate to meet the maximum requirements, and almost the first work to be carried out was the erection of new condensers, and the doubling of the capacity of the scrubbers. Prior to this, traces of tar and plenty of ammonia found their way into the purifiers, which were then worked as follows: The four large purifiers were charged entirely with oxide of iron—three being in action at once, and one off for cleaning purposes; and the two check boxes, with lime only. Owing to the extension of the condensing and scrubbing plant, ere the winter season came on, neither tar nor ammonia could reach the purifiers. The oxide in use at that time being about spent, it became necessary to dispose of and replace it, and the selection of new oxide was rather unfortunate. Not only did it prove to be an oxide that fouled quickly, but, having been purchased rather late in the year, it contained an extraordinary proportion of water. Its unsuitable condition, along with the practically entire absence of ammonia from the gas, made the complete removal of the sulphureted hydrogen almost an impossibility. In fact, had it not been for the judicious use of a little lime in each of the four larger boxes, it would have been quite so. As there was no way of escape, the only course lay in making the best possible use of what first came to hand. A considerable proportion of dry sawdust was thoroughly mixed with each charge after revivification, and the proportion of moisture quickly reduced. As soon as this was brought down sufficiently low, each charge—a few days prior to its return to the purifier—was well sprinkled with ammoniacal liquor of about 4° Twaddell, thereby increasing the life of each charge by from 80 to 100 per cent. Still, as the make of gas increased, it became a difficult matter to keep pace with the fouling material; and once more, atmospheric air was pressed into the service.

This time no definite proportion of air was admitted; but it was made to vary according to the illuminating power of the gas. The exhauster governor being set to give a slight pull, an open pipe was attached to the condenser inlet, varying in size from time to time as the quality of the gas would allow. This, of course, was but a temporary measure, to give relief when in a "tight corner"—sufficient nevertheless to again set one thinking.

Before proceeding further, it may be of interest to give the results of some laboratory experiments made in the early part of the present year on three different samples of oxide of iron, with a view to ascertaining what benefits were derived from the admission or addition of ammonia. The three samples used were one of Irish bog ore, and two of prepared hydrated peroxide of iron. These contained respectively 69.4 per cent. and 22.6 per cent. of free sulphur on the dry basis; the third sample being new and containing no sulphur whatever.

A sufficient sample having been taken from each of the three lots of oxide before mentioned, each sample was divided into two, one-half being treated with water and the other half with dilute ammonium hydrate—sufficient in each case to bring the oxide to a proper state of moisture for use in purifying. Two test tubes were used as purifiers—the first one a straight tube 8 inches long by 1 inch internal diameter; and the second one a **U**-tube 9 inches long by ½-inch internal diameter. Both tubes were filled with the oxide to be tested, and then connected to a service pipe conducted from the main leading from the scrubbers to the purifiers. A No. 1 burner was attached to the outlet of the **U**-tube, which acted as a catch box; and after the air had been driven out, the gas was there burned, giving a light about the size of a small pea. The flow of gas was continued through the test tubes, at this rate, until it turned the lead test paper at the outlet of the **U**-tube. The gas was then turned off; the oxide removed from the test tubes—that in the **U**-tube being thrown away; revivified thoroughly; and then analyzed for free sulphur on the dry basis.

Each sample—three treated with water and three with dilute ammonium hydrate—was treated exactly in this manner, and the results obtained were as shown in the accompanying statement, Table A. These figures will, in the writer's opinion, account for many apparent inconsistencies between parcels of oxide obtained from the same source,

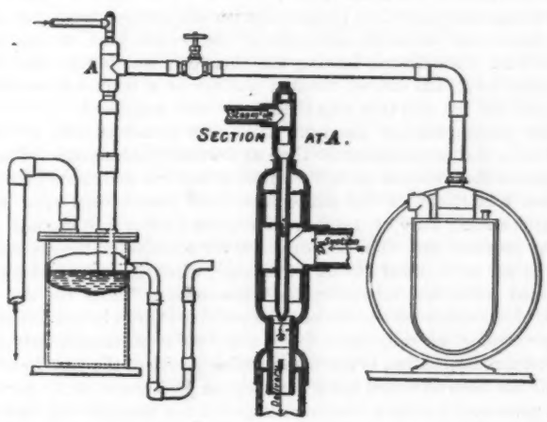
Table A.

Description of Oxide of Iron Used in Experiments.	Free Sulphur Contained before Testing.	Free Sulphur Contained after Testing Treated with Water.	Free Sulphur Contained after Testing Treated with Ammonium Hydrate.	Increase of Free Sulphur due to Treatment with Ammonium Hydrate.	Increased Duty due to Treatment with Ammonium Hydrate.
Irish bog ore ..	69.40 p.c.	70.60 p.c.	72.00 p.c.	1.40 p.c.	116.66 p.c.
Prepared oxide..	22.60 "	24.30 "	25.40 "	1.10 "	64.70 "
" " ..	Nil.	6.10 "	10.90 "	4.80 "	78.60 "
					3)259.96

Average increased duty..... 86.65 p.c.

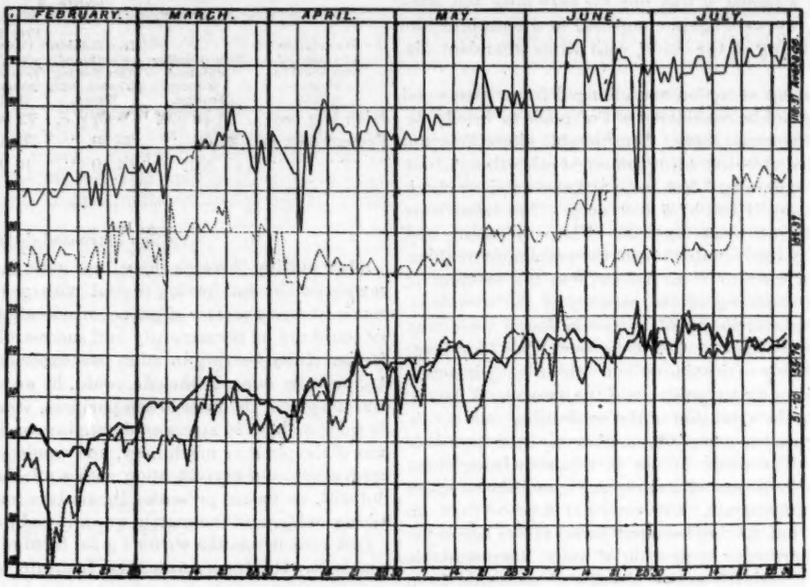
After pulling through the winter with the aid of ammonia and atmospheric air, and having to deal with gas practically free from ammonia, it was a matter of grave consideration as to whether atmospheric air could not be permanently and successfully utilized. After due reflection (fully bearing in mind past experiences), it was concluded that it should be done if the air could, by any simple means, be admitted into the gas at the inlet to the purifiers, where it would go straight to its work without in any way deranging or interfering with any other part of the plant or machinery, and would probably achieve the maximum amount of revivification with a minimum of resultant nitrogen. But still, no means presented themselves for successfully dealing with caking oxide, and the matter was allowed to stand over for some time.

Last year it was the writer's good fortune to hear Mr. Dexter's paper read before the Incorporated Gas Institute, on the use of steam in oxide revivification, which resuscitated an idea that had been previously dismissed as likely to do more harm than good. It seemed likely that, by using live steam, instead of exhaust, much less would be required, and the pressure required could be utilized in some kind of an injector, which would, in the simplest manner possible, enable one to introduce the air against any back pressure likely to arise, and at the point already decided upon—viz., the inlet to the purifiers.



The first step now was to devise a suitable injector. Suffice it to say, that the first attempt was almost successful, for, with but very slight alteration, the injector was made in the first instance as shown on the sketch. After testing it as to pressure and vacuum, it was fixed in position close to the purifier center valve, with meter, trap, etc., as shown. The first difficulty experienced was with the valve and float of the meter, which would suddenly close owing to sudden pulls of the injector caused by stray drops of water passing the nozzle of the steam jet. The valve and float of the meter were removed, and a throttle valve placed on the suction pipe of the injector, giving complete control of the whole apparatus. Owing to the air-regulating valve, no more pull is put upon the meter than is actually required to work it. In fact, so easily does the meter work under this arrangement, that the water level does not seem to be disturbed in the least. As the depth of winter drew near, and the make of gas increased, the maximum capacity of the injector, as then constructed, was arrived at; and after reaching that point, the more steam applied the more irregular it became in its action. The injector was taken out and the length of the neck increased as shown, and no difficulty has since been experienced.

The delivery of the injector dips ¼ inch into water, as shown, giving a safety seal against 20 inches of back pressure; and any water in the mixture of steam and air is there deposited and trapped off. The stream of hot air and steam proceeds forward immediately into the gas main, at a point about 9 feet from the center valve. It intermingles with the gas, and goes straight to its work.



The apparatus is visited once a day, at noon. The state of the meter is then taken, the water line re-adjusted, and the quantity of air passing altered if necessary. It is perfectly under control, and any temperature between 80° and 200° F. can be obtained by simply opening the steam valve and checking the air valve for higher temperature, and *vice versâ* for lower temperature.

Perhaps the time when the greatest benefit accrued from the use of this apparatus was in the early part of the present year, during the severe frost, when the gas leaving the scrubbers was often much below freezing point, but entered the first purifier at a temperature between 90° and 100° F., and this with the steam valve unaltered.

The accompanying diagram will give a better idea of its effect upon the gas temperature than any wordy explanation. The temperatures there shown are at the inlets to the first and second purifiers, station meter, and of the atmosphere; and they extend over the six months ending July 31, 1895, including the coldest and warmest parts of the present year. The proportion of air admitted to the make of gas was 1½ per cent., until January this year, when it was increased to 2 per cent., after making sundry tests, as shown in Table B. As 2 per cent. of air extended the life of each purifier charge by six times, and 1½ per cent. of air only three times, and 2 per cent. caused only an infinitesimal diminution in the illuminating power of the gas, 2 per cent. of air has been admitted since January, in preference to 1½ per cent. The apparatus has been working altogether ten months—the first three months with 1½ per cent. of air and the last seven months with 2 per cent.

Table B.

Proportion of Air.	Illuminating Power of Gas Without Air, in Standard Candles.	Illuminating Power of Gas With Air, in Standard Candles.	Decrease in Illuminating Power, in Standard Candles.	Decrease in Illuminating Power.
1½ per cent.	17.23	17.23	Nil.	Nil.
2 "	17.60	17.49	0.11	0.62 per cent.
2½ "	17.60	17.20	0.40	2.21 "

The temperature of the gas is perfectly under control. No extra back pressure is given, however long the charge may run; and the removal of the material when fouled is accomplished without any extra difficulty. Neither the quantity of gas purified per charge, nor the percentage of sulphur taken up, has been here given, as it would be unfair to the oxides now in use—one half being natural oxide, containing 60 per cent. of sulphur on the wet basis, and the other a prepared oxide upon which experiments are being made respecting the best proportion of moisture at which to work it. It is hoped, however, that this will be sufficient excuse for a little reticence in this respect.

In conclusion, it may be said that the injector, as here shown, is quite capable of dealing with greater pressures than are ever likely to arise, and with a much larger quantity of air than has been requisite in the present case.

Discussion.

Mr. John Chew (Blackpool) said he should like to know what were the advantages claimed for the use of steam. Mr. Shadbolt had given some very interesting particulars as to the use of air rather than the use of steam. He (Mr. Chew) had read Mr. Dexter's paper—referred to by the author—and he thought it very interesting. With regard to enrichment, he should like to know whether it was Hawkins' enrichment process that was referred to.

Mr. Shadbolt—Ordinary enrichment; cannel enrichment.

Mr. Chew (resuming) said the author stated that he used from 1½ to 2½ per cent. of air. With regard to his (Mr. Chew's) experience, he had very large oxide purifiers, also lime purifiers, which were ordinarily worked against 2 inches of back pressure; and last year he had the misfortune to have an explosion owing to the oxide becoming coated by tarry matter. The reason was that the Livesey washer trays had become ineffective. This year he resorted to the Pelouze and Audouin condenser, and had the trays renewed, and new grids and sieves put in; and he now experienced no difficulty. He might say that he ordinarily used about 1½ per cent. of air, which was, in his opinion, as much as could be put in, without endangering the illuminating power of the gas. If lime was used for purifying, the foul lime, when put out into the air, would cause a public nuisance; and with regard to oxide, when the heat from it was being given out, it became very offensive indeed. The object of introducing air was, in many cases, not to gain anything specially, but to mitigate the smells given off by oxide when it was thrown out of the purifiers. By using 1½ per cent. of air, he made the purifiers last as long again as without it. If the steam process would break up the tarry coating at the bottom of the oxide, which was often found, it would serve a good purpose. From what he could gather, practically nothing had been absolutely gained by the use of steam.

Mr. Shadbolt—It prevents back pressure and supplies the motive force for injecting the air.

Mr. Chew said he used an ordinary Roots blower, which was as regular as clockwork. There was often a danger of the back pressure coming on suddenly. He remembered one day when, at 6 o'clock, the ordinary working pressure was only about 18 inches, in a few hours it was 70 or 80 inches, which was caused by the caking of the oxide at the bottom of the purifier—not that his purifiers were small, by any means. If this was avoided by using steam it would be a good thing. Personally, he was very chary about discussing the introduction of air into gas, as the public, immediately they heard "air" mentioned, thought the object of those responsible for the manufacture of gas was simply to increase the consumers' bills. Gas engineers had to fight against such prejudices on the part of the public. He need not say they were entirely without basis, as regards any honorable member of the profession. However, as the public had this opinion, they must be careful when speaking about introducing air, as to how they dealt with the matter.

Mr. Isaac Carr (Widnes) said, though he much regretted that Mr. Shadbolt had been prevented from reading his paper before, he was pleased to know that the delay had allowed him to extend his observations. To his own mind the lesson of the paper was in a nutshell. It was that the work of the purifiers could be greatly increased, and prof-

itably increased, by the introduction of air, moistened by steam, instead of the introduction of air alone, as had been the common practice in years past, at the hydraulic main or the condensers. He had himself been trying to arrange for experiments on these lines; but he had not yet been able to put them into effect. He should certainly, however, after the reading of Mr. Shadbolt's paper, introduce air by means of a steam injector, at the inlet of the purifiers, instead of the old stereotyped method of drawing it in at the inlet of the exhauster.

Mr. Chew said he drew the air in at the outlet of the condenser, and used a Roots blower for the purpose, and a small engine which regulated the operation to a nicety.

Mr. J. Braddock (Radcliffe) observed that he had had some little experience during the last few years in methods of prolonging the life of purifiers, but he had not come to quite such an elaborate system as had been presented in the paper. His efforts had recently been in the same direction, but they took this form—that he introduced the steam at the inlet of any one of his four purifiers, and not at the main inlet through the center valve. His reason for doing this was that, by bringing the air in through the center valve, the valve (which was of peculiar construction) was affected by the heat of the steam to a deleterious extent—owing, perhaps, to the heat setting up unequal expansion. Whatever might be the cause of this, he dispensed with the previous arrangement, and now introduced the air to any one of the four purifiers that he cared to apply it to. It certainly had a beneficial effect, not only in prolonging the life of the purifier, but in very considerably preventing the caking of the oxide; and instead of having, at this time of the year, to use the pick and spade, the spade itself was quite enough. Another advantage was that the purifier was not so objectionable to the men as it would be under ordinary conditions. In regard to illuminating power, he was at present using about 2 per cent. of air, and it was only at this time of year that he could use such a percentage. If it were continued to the busier season, it would prove very unsatisfactory.

Mr. A. Sheirs (Kidsgrove) said he was at present considering the question of alterations at his works, and he should have liked more information on this matter than the author had given. In his case, the gas entered the condensers at 147° F., and left at 60° F. After going through the exhauster and the washer-scrubber, he found that at the outlet of the purifier it increased to 90°, and then decreased to 55°. By introducing steam, caking took place, and this caused some choking or back pressure, bringing on a stoppage of the purifiers—the water blowing out of the lutes. He did not know whether he was using the proper quantity of steam; but he certainly found that the material caked and caused back pressure.

The President said the paper had been specially interesting to himself. It was about 11 years since he first introduced air into his purifiers. He then used Hawkins's patent, which was simply an air-pump—the quantity of air being measured into the purifier according to the make of gas. The air was passed through a chamber containing all the tar that was made on the works, and heated up to 75° or 80°. The air was then passed direct into the purifiers; and, he must say, he found great benefit from doing this, as it made the purifiers last twice as long and effected a great saving of labor. This went on for a number of years, until in 1894 the shaft of his washer scrubber broke, and he was compelled to pass all the gas direct to the purifiers. Then, whereas prior to this occasion the ordinary work of the purifiers had been about 750,000 cubic feet, the first purifier after the breakdown of the scrubber purified about 5,966,000 cubic feet—lasting about 21 days. The second one ran for 31 days, and purified about 6,000,000 cubic feet. He read the paper by Mr. Dexter (referred to by the author) on the injection of steam into the purifiers; and first of all he injected the steam as near as possible to the air-pump. But in this case he did not find much benefit, because the steam was so far condensed before it arrived at the purifiers that it was ineffectual. He might say that the temperatures he could get with his purifiers had been 65° to 70° upon the foul purifier. He then set to work and injected the steam with Hawkins's pump close to the valve of the purifiers; and he could then raise the temperature up to 95° or 100°. Since he had done this, he could run the purifiers as long as he thought proper, without any back pressure, and the average work was about 2,000,000 cubic feet. He was now convinced, from what Mr. Braddock had said, that the proper way to inject the steam was into the bottom of each purifier, and then the temperature—which had a great deal to do with all chemical processes—could be increased to at least 100°, and thus oxide would do its work better. He was satisfied that the author was going in the right direction, and that Mr. Braddock had given a valuable suggestion.

Mr. Shadbolt, in replying to the discussion, thanked the members for their complimentary opinions, which would induce him, if again called upon to bring forward a paper, to do so with pleasure. With regard to Mr. Chew's remarks, he might say that prior to Mr. Dexter's paper he had been deterred from trying the steam process, owing to several gentlemen he knew saying it would not act. But Mr. Dexter convinced him. With regard to Mr. Dexter's paper, however, that gentleman had, he believed, some kind of steam scrubber similar in construction to an annular condenser, which cost a good deal of money, and therefore could not be used in such works as his own. A £5 note would pay for the whole affair that he had described, and it could be made to turn out enough gas for ten works like his own. The matter of cost was therefore an important item. In Mr. Chew's case the 1¼ per cent. of air he admitted extended the life of the purifier to twice its previous life. In his (Mr. Shadbolt's) case it increased it three times; and 3 per cent., six times. The question as to the non-caking of oxide was one of the special advantages of steam. Mr. Braddock's experience with the center valve was most remarkable and exceptional. Mr. Sheirs's case was exceptional. He (Mr. Shadbolt) should fancy that with the gas entering the purifiers at 80°, it would probably have not only light, but heavy oils in it before it reached there, and the steam injected would convert it into a kind of pitch, which would prevent the progress of the gas almost immediately. Of course, they must remember that the conditions varied with each works, and no doubt, if the whole of the conditions at Mr. Sheir's works were understood, the difficulty could be removed. The President's remarks bore out his own experience. He might add that, if they allowed too much ammonia to go through the purifiers, pressure would be produced. It was all a question of proportion. There was still a good deal to learn about gas purification, and he was glad they thought his paper had given them some useful suggestions.

A Plea for Better Construction Work.

[By Mr. Kepple Hall, in *Electrical World.*]

There are so many technical subjects under discussion in our electrical journals, and so much new experimental work being pursued and reported upon, that very little time or space is devoted to the actual practical side of electrical engineering. It is not the writer's intention to belittle the valuable papers that are weekly communicated to the electrical public through the press, nor in any way to detract from the importance of a careful and theoretical investigation of all subjects related to the science of electricity. The man who cries down theory, who scorns the mathematical consideration of delicate subjects, who relegates all such matters to a few experts "who have time for such things," is not a man to be relied upon. Better to have theory and no practice, than practice and no theory, for in the former case the practical part is easily acquired, while in the latter the possessor of the practical knowledge must stumble along in an unintelligent way until sooner or later he encounters a problem that he has no means at his command of solving, and he comes to grief.

But to return. It is an unfortunate fact that the average electrical installation is inexcusably poor, displaying for the most part poor workmanship, poor arrangement and poor judgment. Why is it that people will submit to have poor work done for them in the electrical line, while they are most exacting as to carpentry, masonry or plumbing? I think that this question can be answered from two standpoints. First, from the public standpoint. The average man does not know much about electrical work, and is not competent to judge whether it is done correctly or not. If he wishes electric light and has a dynamo of his own, he smiles with satisfaction when the lights burn, shakes his head with a mysterious air, remarks that "electricity is a wonderful thing and *still in its infancy*," pays his bill in haste, and repents at leisure when things begin to go wrong. Then the fact begins to dawn on his intellect that his whole installation is a mass of corruption, and when it is too late he awakes to see that there is a difference between good work and cheap work, and becomes a wiser man in the future.

The other standpoint is from the side of the contractors who do this work. As soon as electricity becomes generally applied as a means of light and power and the field for construction work broadened, there rushed into the business a large number of men who had perhaps been telegraph or electric light linemen, and who understood in a general way what must be done to make lights burn or bells ring or motors run, with absolutely no qualifications for contractors, and not even able to do a good, clean job in bell wiring. This sounds pretty severe, but is it not true? I am referring to the average contractor or constructor. There are, as we all know, parties who do good work, beautiful work, and who absolutely refuse to make a cheap, poor job, even if they lose patronage temporarily, to say nothing of money, by taking such a stand.

These are the men who eventually succeed and who are bound to reach the top, if they only have the courage and the patience to hold out. But the average contractor flourishes and has plenty of work to do for a time, before he begins to go down hill, and in the electrical profession to-day there are a larger number of poor jobbers and a greater amount of wretched work done than in any other known branch of business.

The simple fact is that electricity, or at least electrical construction, is not in its infancy at all. It is a full-blooded youth, and the work has become an art just as much as carpentry or masonry, and there are men who can do and do do fine work in this line. Then, you ask, if this is true, why need we worry, for the best men must reach the top and the inferior ones go down, and the same principles will govern this business that rule others. True; but the application of electricity is widening every day. New electric light and power companies are being incorporated, more people are availing themselves of the advantages offered, and more men are needed to do the work. A large majority of those who turn to this field are incompetent, and a large proportion of the gullible public are yet to be gulled before they learn by sad experience their error. Now, all this will take time, and in the meanwhile the reputation of the profession must suffer in consequence, unless some urgent measures are taken by those who are really first-class to protect themselves. This requires the co-operation of the public and the good contractor.

When a man wants work done, and gives it out to contractors to bid on, and receives a number of proposals all in conformity to the general specifications, but varying widely in price, he almost invariably selects the lowest bidder, especially when he does not know much about it himself and cannot understand why there should be such a discrepancy in the price when all are going to do about the same work.

Let us look a little carefully into the matter and we will discover why this difference does exist. The high bidder has found out from experience and an understanding of his business that in order to have work done skillfully (wiring, for instance), he must employ men who not only know how to tie wires, but who will be familiar with the place they have to work in, and know how to go about things in the best way. He is apt to select carpenters, and finds that they will make excellent inside wiremen. They know how a building is put together, they know where they can cut joists and stringers, and what is just as important, if not more so, they know where they *must not* cut and notch. They know how to remove and replace lath and plaster when this is necessary, without tearing down the whole wall of a house, and appreciate the necesssity of having good, sharp tools to work with. Each such man he pays from $2.25 up per day of nine hours. He has also found out that the cheap sockets, switches, cutouts, wire and other materials may last for a time and give satisfaction temporarily, but that eventually they will get out of order and cause trouble. For these reasons he discards cheap labor and materials and figures on what he knows to be good and lasting.

The lowest bidder can get a laborer to work for 10 hours a day for $1.25 or $1.50. He is a willing worker, a good man with a sledge, and can do wonders with dull tools, make a lot of dust and dirt and generally demolish things. Why pay more for a quiet, unobtrusive carpenter? He can buy materials cheap. The sockets and switches will work, and the lights will burn when he turns them on. Why pay more for better ones even if they will last a little longer? That is what makes the difference in the estimates. In nine cases out of ten the low bidder gets the work, the lights burn, and the owner is satisfied until things begin to get out of order. Even then he is willing to pay a little now and then for repairs, and it is not until the whole installation goes to pieces, until the originally cheap job has been patched up until it will stand no further repair, but must be torn out and done over again, that he appreciates the advantage of having things done correctly at the outset, and realizes that he should have been as careful that his electrical work was done right as he was about the rest. Until this crisis comes, however, the low bidder flourishes, and the high bidder is looked upon as a fancy price man, whose work is good, to be sure, but who charges too much.

I have often wished that people could see comparative work done, so that they might better appreciate what a difference there is between good and bad electrical construction. I have seen a private house wired for electric lights from cellar to garret, concealed work throughout, without disturbing or inconveniencing the family, or leaving a board out of place at night, or a speck of dirt where the men had been working. I could not but feel after it was all done and in working order, that I would like that family to have the low priced man with his "destruction" gang do the work over, that they might draw comparisons that would be beneficial to the profession.

It is certainly distressing to see men holding positions of responsibility in connection with electrical installations who are absolutely unfitted for them. I cite the instance of a superintendent of a fire alarm system, who in his own estimation is one of the first electrical engineers in the country, but in reality is a clumsy blockhead. In conversation with a member of the local electric light staff he proceeded to explain that he had a remarkably sensitive taste, and could always tell whether his batteries were in good condition or not by tasting them. He considered this a great accomplishment, and one that would make him famous. It never failed. The electric light man listened in respectful silence until he had finished, when he quietly remarked, "Our line will get across your old fire alarm wires some day, and then you'll find out what 5,000 volts will taste like. That will be a good thing to know, too." I have not heard how much progress he has made in the science of tasting batteries since then. But this is the way in all the branches of electrical engineering, until eventually the uninformed will find out the truth and learn to discriminate; but in the meantime the "electrical infant" must suffer trials and tribulations enough to send it tottering to an early grave.

I have headed this article "A Plea for Better Construction Work." That what has been said or what is to follow is no news to the profession I am well aware. The truth of it has doubtless been instilled into their minds long ago. But as little has been written on this subject, a few particulars may not be amiss before concluding, not so much for the edification of contractors as for those who are having electrical work done.

In the first place, never have concealed work done in anything but interior conduits. Contractors may insist that wiring in porcelain tubes and on cleats, under the floors and behind the plaster, is plenty good enough, and that there will be no danger of anything going wrong. This is not so. The insurance men may permit this practice, but fire is not the only thing to be guarded against. Some plumbing or carpenter work will be done some time, and a wire will be broken or grounded, and then comes the search for the trouble, with the consequent tearing up of floors and walls before the trouble can be reached and remedied. A conduit carefully installed, with all couplings made tight, so placed that it will be out of the way, or, better still, made of iron, when it is indestructible, continuous from cutout to outlet and from outlet to outlet, leaves little or nothing to be desired. It is a simple matter to pull out a wire and shove a new one in, but it is a pretty serious matter to replace one when no such provision has been made.

The indiscriminate scattering of cutouts or fuse blocks is to be condemned. If possible, it is advisable to have every fuse in one place, where it can be easily replaced without searching all over for the right cutout. This costs more money, for it requires more tube and wire; but when the convenience is taken into consideration it will be found to more than pay. Of course, where a building is very large, such a plan is not feasible, but in this case distribution centers for each floor can be selected and all the cutouts gathered there. Then every fuse should have stamped copper terminals, showing the carrying capacity, and when a fuse blows one knows what to replace it with. Great care should be taken not to have any one set of lights on one fuse, but all should be arranged so that when one circuit is disabled no place will be left in total darkness. Then there are the miserable switches that are so flimsy that they melt up when half loaded, or are so poorly adjusted that they can't be depended upon for half a day at a time. The same of sockets and other materials may be said. This is what makes the cost of house wiring vary so in amount, and it is not simply necessary to look at a man's bid before giving him the work, but to examine into his materials and see what he is going to use, and how he is going to use them.

A contractor can generally be sized up from the way in which he performs small jobs. Every man in the construction business is called upon, from time to time, to do small pieces of work, not amounting to much in cost or profit, but work that must be cheerfully done and well done, in the hope of some time securing larger work from the same party.

Let us take, for example, ordinary bell wiring, for call bells or annunciator. Bell wires should never be run in plaster as is generally done, and two wires should never be fastened under one staple. Installations put in in this miserable manner may give satisfaction for a long time, but when once trouble does occur, it is next to impossible to remedy it. Bell wires, where they run behind plaster, should always be run in tubing, and the man who takes this precaution and uses bells that can be relied on not to get out of adjustment for years, push buttons that will continue to work satisfactorily after long usage, and good reliable batteries, is the man to be trusted with large contracts, with the

assurance that the work will be done with the same painstaking care that has characterized his other work.

In conclusion, a few words to the contractor. Never be persuaded to do inferior work in order to secure a contract. This principle rigidly adhered to will eventually lead to success. The waiting will be hard and it will often seem as if the policy didn't pay, but it will in the end without any doubt, only stick to it. In conversation with a prominent hardware dealer and plumber a short time ago, talk turned to the subject of doing first-class work with first-class materials. He told me that when he began to handle heaters for residences he had a long line of them standing in his store, ranging in price from $100 to $25. A customer would be shown the high-priced heater first, go down the line and probably buy the cheap one. A man can't condemn his own stock, so the dealer couldn't say that the cheap heater was no good, for then the inevitable question would be asked, "Then why do you sell it?" Winter would come and then the trouble would begin. Not enough heat, not a good enough furnace to be capable of giving enough heat. Friends visiting the house on a cold day would hear the tale of woe, the dealer's name would be mentioned, and down would go another black mark opposite his name and reputation. This continued for some time, until finally he adopted one first-class, high priced heater, and threw all the rest out. He now has no trouble, no complaints, and but little competition. People know that he does good work and can be relied on. The extra amount paid will not be wasted. This is true in the electrical business. There is plenty of room at the top for those who will do exclusively good work, and prove by their action and business methods that they have a right to that position.

Another experience may further serve to illustrate our moral. Some electric ceiling fans were sold to the proprietor of a restaurant. The buyer sent the measurement of the ceiling and the fans were ordered. The wiring was done, and when the fans arrived they were 2 feet too short. The customer had given the wrong height of ceiling. It was his fault, he was in a hurry, so the fans were pieced out with iron pipe and put up. It was not a neat job, but he was perfectly satisfied, and paid his bill. A few days after another man came in, looked at the fans and inquired who did the work. On being told he walked out, went to another dealer, and gave him an order for fans at a higher price than had been quoted him previously by the man who put the fans in the restaurant. It didn't pay to leave those fans looking like that for a day, and it never does pay to do slovenly work, no matter who is satisfied.

The few particulars enumerated above might be extended indefinitely to every branch of work, for what is true in one is true in all. These should suffice to illustrate the point, and individuals can apply what has been said of house wiring to the equipment of electric roads, light and power stations and work of greater magnitude.

If, on the one hand, owners would insist on having better work done, and if contractors, on the other, would refuse to do cheap work, both would combine in assisting to put electrical construction work on a higher basis and hasten the time when true merit would be appreciated and rewarded. This standard has already been established for other branches of labor, and it is high time that it should be brought about in ours. The writer had occasion to call attention to the fact that architects should be careful to have their specifications accurately drawn and the electrical work under their jurisdiction skillfully superintended, in an article published in this journal some months ago. The perfection that has been attained in the manufacture of machines, instruments and materials for electrical purposes should call for a higher grade of workmanship in their installation.

The public must be educated, and it is far better for them and for the trade that their knowledge be acquired by finding out that good work can be done, than learning that it is a rarity to find good workmanship in electrical construction.

Guldlin's Oil Atomizing and Carbureting Apparatus for Gas Generators.

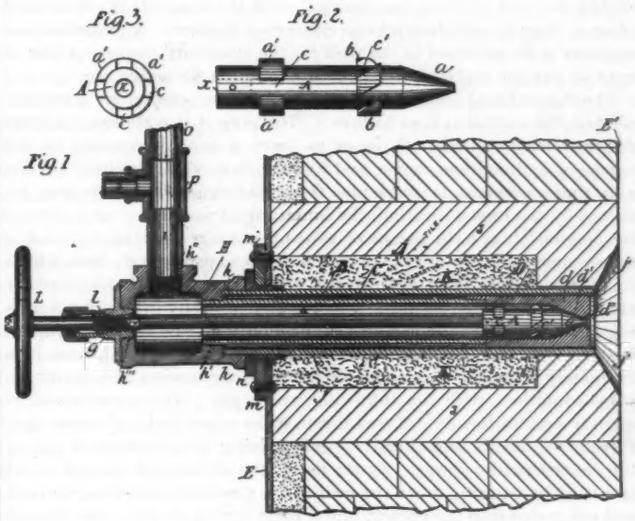
On September 10th U. S. Letters Patent (No. 546,011) were issued to Mr. O. N. Guldlin, of Fort Wayne, Ind., for improvements in oil atomizing and carbureting apparatus for gas generators. Using the words of the specification:

This invention relates to an apparatus for carbureting or enriching water gas with hydrocarbon vapor; and it relates more particularly to an improved device for atomizing hydrocarbon oil and injecting it into and mingling it with water gas in the carbureting chamber of the superheater of a water gas apparatus.

The objects of the invention are to provide for more perfectly and economically carbureting water gas with atomized or finely divided hydrocarbon oil and doing away with the jet of steam usually employed for injecting and spraying oil, and thereby effecting the saving of a large per cent. of hydrocarbon oil required for carbureting water gas to the desired candle power; also, to provide a simple, durable and efficient device for atomizing liquid hydrocarbon and injecting it into and intimately mixing it with the water gas in the carbureting and fixing chamber of the superheater, so as to thoroughly carburet the gas without diluting and deteriorating it with steam; also, to provide a device so constructed and arranged that the various parts may be readily detached and cleaned or repaired and quickly assembled for operation.

The improved apparatus for carbureting water gas is illustrated in the accompanying drawings, in which Fig. 1 represents a longitudinal section of an oil atomizing and injecting device applied in position in the wall of the superheater of a water gas apparatus. Fig. 2 represents an elevation, on enlarged scale, of the atomizing plug having a conical valve section. Fig. 3 represents a rear end view thereof.

The atomizing plug *A* of the device is constructed with a cylindrical body having a conical end *a*, serving as a valve, and said body is provided with a circle of lugs *a'*, projecting from its circumferential portion and forming between them a series of ducts or passages *c*, said lugs



serving to break up the oil and also to guide the body *A* in its casing. The body *A* is also provided near its front end, just back of the conical end *a*, with a circle of diagonal or spiral lugs *b*, forming a series of diagonal or spiral passages *c'* for imparting to the oil a whirling motion as it is expelled from the atomizer into the carbureting chamber. The lugs or projections *b* are formed upon or secured to the body *A* in position diagonal to the longitudinal axis of the plug and the intervening passages *c'* are formed in the same diagonal relation to the axis, and will therefore impart to the oil a whirling motion. It is to be noted that the inclined lugs *b* are arranged upon the surface of plug *A* so as to break joints with the lugs *a'*—that is, so that each lug *b* shall be in line with a passage *c* between the lugs *a'*, and will therefore serve to deflect the current of oil and assist in atomizing it.

The atomizing plug *A* is inclosed within suitable tubes or casings, which are inserted in the wall *E* of the superheater as will now be described. The external tube or casing *B* is preferably made of wrought iron and is screw-threaded at its outer end to engage with the T-coupling *H* and bushing *n*. The inner tube or casing *C* is preferably constructed of wrought iron and is screw-threaded at both ends, as shown. The nozzle *D* is preferably constructed of thick steel and is screw-threaded at its rear end, where it engages with tube *C*, and at its front end is provided with a thickened head *d*, having a conical valve seat *d'* and a flaring vent or mouth *d''*. The nozzle *D* is made thick and strong to prevent it from being warped or readily burned out by the heat, and it serves to hold the atomizing plug *A*, and has a seat for its conical valve section *a*, by means of which the flow of oil may be regulated and entirely shut off at will. The lugs *a'* and *b* of the atomizing plug fit snugly within the nozzle *D*, so that the oil is compelled to pass through the passages *c* and *c'*. The stem or rod *G* is connected to plug *A* by a pin at the socket *x*, and is also connected in a similar manner to the shaft of the hand wheel *L*. The T-coupling *H* at the outer end of the casing

is provided internally with screw-threaded seats *h* and *h'*, respectively, for connecting the tubes *B* and *C*, and also with the internally screw-threaded branch *h''* and the screw-threaded opening *h'''* at its outer end. A stuffing box *g* is secured to the end of the coupling *H* and is provided with a screw-threaded bearing for the screw-threaded portions *l* of the shaft *L*, by means of which the plug *A* may be adjusted out or in to regulate or shut off the flow of atomized oil. A T-coupling *p* connects by nipple *I* to the branch *h''*, and has connecting with it the oil supply pipe *O* and a steam supply pipe *S*, the purpose of which will be hereinafter described.

The wall *E* of the superheater is constructed of brick and an iron jacket in the usual manner, and is provided especially for the atomizer and injector with a large tile *J*, having a recess or socket *j* for containing the asbestos or other non-conducting fireproof packing *K*, and said tile *J* is also formed at its inner end with a flaring opening *j'*, extending from the inner end of the injector casing to the inner surface of the carbureting chamber *E'*. A thick ring *m*, having a central screw-threaded opening, is riveted to the iron jacket of the wall *E*, and within the opening of this ring is inserted the screw-threaded bushing *n*, and within such bushing is secured the outer tube or casing *B* of the device. The asbestos packing *K* is packed around the casing *B* for protecting it from excessive heat. The outer casing *B* may be left in place within the wall *E*, while the casing *C*, with the nozzle *D* and atomizing plug *A*, may be withdrawn to be cleaned or repaired. A protected passageway is thus formed in the wall for the atomizing device, so that it may be quickly replaced and secured in position for active use.

The device being constructed and secured in position as above described, the operation is as follows: The plug *A* is withdrawn a short distance from the seat *d'*, so as to leave a suitable opening for the escape of hydrocarbon vapor, and hydrocarbon oil is admitted, preferably under pressure, through pipe *O* into the casing *C*, and is first deflected by the lugs *a'* through the longitudinal passages *c* and against the diagonal lugs *b*, by means of which it is dashed into spray, and is thence deflected through the diagonal or spiral passages *c'*, from which it is forced tangentially against the tapering seat *d'*, thereby further atomizing it, and the resulting vapor is thence discharged with a whirling motion through the flaring vent or mouth *d''* and the flaring opening *j'* into the carbureting chamber *E'* of the superheater, where it is intimately mingled, on account of its whirling motion and finely divided condition, with the inflowing water gas. The atomized oil is quickly and uniformly diffused through the whole body of water gas, thereby uniformly and effectively carbureting it to produce a gas of the desired candle power. By the use of this device and method no oil is wasted by running down the wall of the generator and being burned and converted into lampblack, and a large saving of oil is also effected on account of the absence of steam, which is usually employed as the oil injecting agent, and which results in diluting and deteriorating the quality of the gas, and on account of which, therefore, a much larger quantity of oil is required to produce a given candle power of gas. If oil is allowed to flow by gravity through an ordinary pipe into the superheater, it is apt to run down along the wall and the brickwork in streaks and injuriously cool the same, and thereby prevent vaporization and mixture with the water gas. This device and method overcome these objections and produce greatly improved results. The atomizing and injecting device is set in the brickwork with its front end back from the interior face of the wall of the carbureting chamber, so that it is protected from intense heat; but in case the nozzle becomes clogged with thickened or burned hydrocarbon, or the casing *C* becomes clogged by deposits of naphthaline or paraffine or other obstructions, a jet of steam is admitted by pipe *S*, while the oil is shut off, and will quickly melt and force out the obstructive deposits.

This oil atomizing and injecting device has proved very effective and economical in practical operation, and by its use have been obtained greatly improved results in the manufacture of carbureted water gas.

The inventor's claims are:

1. In an apparatus for carbureting gas, the combination, with a casing having a nozzle and valve seat, of an atomizing plug inclosed within said casing and provided with a valve end and adapted to close on said seat and series of circumferential lugs arranged to break joints, longitudinally, one with another, and form intermediate passages for atomizing the oil, an operating stem connecting with said plug, and an oil supply pipe connecting with the casing, substantially as described.

2. In an apparatus for carbureting gas, the combination with a casing of an atomizing plug inclosed therein and provided with a series of circumferential lugs having passages parallel with the axis between them, and a series of lugs disposed diagonally to the longitudinal axle of the plug and having diagonal passages between them for atomizing the oil and giving it a whirling motion, and the oil supply pipe connecting with the casing, substantially as described.

3. In combination with the carbureting chamber of a superheater, a casing and nozzle having a valve seat, a cylindrical atomizing plug having a solid valve end adapted to close on said valve seat, and the body of said plug, also provided with circumferential lugs, so disposed as to break joints one with another, longitudinally, and part of said lugs being disposed diagonally to the axis and having diagonal or spiral passages between them for atomizing the oil and giving it a whirling motion, a stem connecting with said plug, and an oil supply pipe connecting with the casing, substantially as described.

Contraction versus Strength of Cast Iron.

[A paper read by Mr. Thos. D. West, before the Foundrymen's Association.]

In a paper which the writer presented to the Iron and Steel Institute meeting, held at Birmingham, Eng., Aug. 20, 1895, the following question is suggested: "Is there any form or size of a bar that, having been proved untrustworthy as a record of degrees in strength of cast iron, can truly record the contraction?" The object of the present paper is to prove that the same element that can cause any form or size of a test bar to be unreliable as a record of the strength of iron also destroys its value for recording the contraction of an iron.

In a paper entitled "Comparison of Strength in Specialty Mixtures of Cast Iron," which the writer presented to the Western Foundrymen's Association, October 24, 1894, he showed that a test bar as small as ½-inch square could not give correctly the strength of an iron. Since that time, no one, to the writer's knowledge, has offered to the press any tests with a ½-inch square bar, to be made a standard of comparison of the strength of cast iron. The writer has reason to affirm that the ½-inch square test bar is not now being advocated as of any value to give a true record of strength as was done previous to the appearance of his tests on specialty mixtures of cast iron. But it is now being vigorously contended for as the best size of bar to adopt as a universal standard for comparisons of contraction of cast iron. The coming issue of the proceedings of the last two meetings of the American Society of Mechanical Engineers will show this last statement to be true.

As our leading Engineering and Foundrymen's Associations, which include the American Society of Mechanical Engineers, the Iron and Steel Institute, the Institute of Mining Engineers and the Eastern and Western Foundrymen's Associations, are at the present time taking much interest in the subject of testing cast iron, the writer desires that this paper be added to his other communications on this subject and asks that it receive the most critical examination, to the end that the best may be adopted.

As indicating the unfitness of a test bar to record contraction of cast iron, when it has been proven of no value to record strength, experiments which the writer has lately conducted have demonstrated that the percentage of combined or graphitic carbon in a light casting or small test bar can often be regulated as much by varying conditions in the physical qualities of the mold as by varying percentages in the elements of sulphur, silicon, manganese, phosphorus, etc., generally contained in foundry pig metal. We will first consider the physical qualities which can affect the strength of an iron, according to the size of a casting or test bar, and which is chiefly, if not wholly, dependent upon the nature of the carbon, whether it is in the combined or graphitic form.

Believing from the results of previous experiments and everyday experience that if the corners and the central portion of square test bars were analyzed, a difference would be found to exist in their percentage of combined or graphitic carbon; also that the combined carbon would be less in a 1-inch square bar than in a ½-inch square bar, both poured from the same iron and gate, I forwarded the specimens of which the analyses are herewith given to Chas. A. Bauer, M.E., General Manager of Warder, Bushnell & Glessner Co., Springfield, O., who had his son, Chas. L. Bauer, a chemist, make the determinations shown in the following paragraphs:

The specimens were ½ inch square, 1 inch square and 1½ inch round bars belonging respectively to light machinery and chill roll iron tests, which were among those reported in my paper before the Western Foundrymen's Association, Oct. 24, 1894. Paragraph No. 1 gives the combined carbon at the corners and center surface of the fracture of the 1 inch square bars in the chill roll and light machinery mixtures.

Paragraph No. 2 is a report of the sulphur content of the center of the bars shown in paragraph 1, and also that of the ½ inch square and 1½

inch round bars shown in paragraph 3, and which were poured with the same gate and iron as those in paragraph 1.

Paragraph No. 3 shows the difference in combined carbon existing in the center of the ½ inch square, 1 inch square and 1½ inch iron bars described in paragraphs No. 1 and 2.

Determination No. 1.—Combined carbon in chill roll iron: At the corners, 1.55 per cent.; at the center of the fracture, 1.416 per cent., or .134 more combined carbon in the corners than in the middle of the test bars. In light machinery iron: At the corners, .72 per cent.; at the center, .650 per cent.; or .07 per cent. more combined carbon in the corners than in the center of the fracture.

Determination No. 2.—Sulphur in chill roll iron: At the center of fracture in ½ inch square, .046 per cent.; 1 inch square, .044 per cent.; 1½ inch round, .046 per cent. In light machinery iron: At the center of fracture in ½ inch square bar, .0819 per cent.; 1 inch square, .079 per cent.; 1½ inch round, .0825 per cent. Mr. Bauer writes that the difference in sulphur at the center and the corners of the different bars is not perceptible.

Determination No. 3.—Combined carbon in chill roll iron: In ½ inch square, 2.7 per cent.; 1 inch square, 1.416 per cent.; 1½ inch round, 1.25 per cent. Difference in the extreme of the combined carbon in the ½ inch square and 1½ inch round bar, 1.45 per cent. In light machinery iron: In ½ inch square, .854 per cent.; 1 inch square, .650 per cent.; 1½ inch round, .704 per cent. Difference in extremes, .204 per cent. of the combined carbon in the ½ inch and 1½ inch round test bars at their center of fracture. The silicon in the light machinery is 1.33 per cent.; in the chill roll, .71 per cent.

The percentages of sulphur, silicon, manganese and phosphorus in cast iron are but factors in connection with the time it takes a casting or test bar to solidify and become cold, determining the degree to which the carbon takes the combined or graphitic form. The percentage of combined carbon in a casting or test bar controls the strength of the iron and also its contraction.

The above exhibits plainly prove that difference in the fluidity of metal, conditions in the "temper" of sands, whether wet or dry as commonly used in ordinary foundry practice, and variations in the form and size of test bars can cause a difference in the percentage of combined carbon, in the same size and form of small castings or test bars from the same mixture of iron, poured out of the same ladle. The tables also indicate necessity of adopting as a standard for physical tests the form of test bar least liable to irregularities in the combined carbon composing its shell or outer body, and caused by varying conditions in the temper of sands, melting of iron, etc.

As degrees in the strength of iron can be affected by the "temper" of sand and fluidity of metal at the moment it is poured, so can contraction records be largely affected, making them deceptive. Experiments which I have conducted to discover if the same conditions which give erratic results in strength records would not do likewise in contraction, have only confirmed me in the advocacy of a round bar cast on end, wherever one desired to be wholly or partially guided by physical tests or establish a universal standard for record.

To learn whether differences in the mold could cause changes in the length of contraction in bars of the same size, cast in the same mold with the same iron, out of the same ladle and at the same moment, I took three patterns ½ inch square, 12 inches long, and cast two of them between yokes and a third bar in a divided chill to form two sides and bottom of the mold, the fourth side being formed by the sand of the cope. The two bars cast between yokes had drier sand for one than for the other. The wet sand was not so damp but that a sound casting would be produced, and the two sands differed no more than can generally be found between the "temper" of sands in one shop. All three bars were placed equi-distant in the mold, and gated by means of two upright "sprues" which led down to a runner in the cope extending over the three bars in their center, insuring the filling of the three molds at the same time with the same hand ladle of iron. The test bars formed in the chill and dampest sand would show a greater contraction than the one inclosed in the driest sand. I have conducted quite a number of these tests, and always found them in the same line, those cast in the chill showing the greater contraction. In several cases the extremes of one flask gave a full $\frac{1}{16}$ inch difference in the contraction of the three bars. In the extremes between the "temper" of the wetter and drier sand, I have found a difference of fully $\frac{3}{32}$ inch to exist in the contraction of two ½-inch bars poured from the same hand ladle at the same moment, thereby proving that a test bar as small as ½ inch square, or even round, is altogether too sensitive to variation in the "temper" of molding sand to be relied upon to afford any true knowledge of the natural contraction of an iron.

To answer the question what effect, if any, degrees in "temper" of sand would have on a round bar cast on end, I took a pattern 1½ inches in diameter and made a dry sand mold, using a piece of 6-inch gas pipe to mold it in, leaving both ends open. After this little mold was dried in an oven, it was then set on end upon a planed plate and the distance equally divided between two empty gas pipes. Each of these two latter pipes was then rammed up with "green sand" of a different temper. Each test bar had a projection cast on the upper end exactly 2 feet from the bottom of the mold, which was formed by the bottom plate to measure contraction by. The three bars were poured from one runner in the center of the three molds, the iron dropping from the top. I made these three bars 2 feet long, so as to give a greater length than was in the 1 foot ½ inch square bars, to better detect any difference that might exist in the contraction of the bars due to variation in the "temper" of the sand. On measuring these bars, no difference could be found in their contraction. A further proof of the necessity of using a bar larger than ½ inch square or round to show the real contraction of an iron.

I also made tests with 1½ inch round bars cast flat, but did not find that the radical variation which existed in the "temper" of the sand made any difference in the length of their contraction. Previous to these tests, I also made some in our foundry in the presence of E. Duque Estrada, M.E., of Pittsburgh, a member of the American Society of Mechanical Engineers' Testing Committee, to learn whether degrees of fluidity of iron would affect the contraction of such large sized test bars or thick castings. To test this point, two bars 2 inches square and 48 inches long were molded together in the same mold. One was poured with the metal as hot as it could be obtained from the cupola and the other with the same ladle cooled down to have the metal as dull as possible and still obtain a full run bar. Two sets of these experiments were made, but no difference was found in the contraction. The fact of there being no visible difference in the contraction of these 2 inch square bars cast flat, also the 1½ inch round bars cast flat on end, was due, I would say, to the body of the test bars being sufficiently massive to overcome any tendency which the variation in the "temper" of sand could exert in causing higher combined carbon to exist in them than the iron naturally contained.

With large sized test bars cast on end, or those having over one inch area and possessing no corners, as in the hexagon test bar now proposed as a compromise between the round and square bar, we are justified in placing confidence in the record which they may present. And were it not that in accepting castings there is generally a large leeway permitted the founder, regarding the physical property of the iron in his castings, the error of the system for which some have claimed so much would have been clearly demonstrated long ere this.

The California Oil Industry.

Mr. R. W. Burnham, in a communication to the Los Angeles *Times*, on the matter named in the heading, says:

Just at this time, when sagacious men in all parts of the United States are looking for a period of great industrial progress and commercial expansion, enterprising men in Los Angeles and elsewhere in California are asking pertinent questions regarding the discovery of petroleum in the heart of the city. Is the problem of cheap fuel solved? Is oil being produced in valuable commercial quantities? What does the oil industry mean to the community at the present time? What is its vital bearing on the future of the city? Has the industrial situation of Los Angeles changed during the past year? And, lastly, has it a new base for prosperity? Hitherto this section has invited the agriculturist, the invalid, the man of means who desired to escape the rigors of Eastern climate. Can the range of its call be broadened? Is it in a position to offer a fair and promising field to the manufacturer? Here are a few facts and figures that may prove interesting.

With the history of the development of this local oil territory all are familiar. Its progress since April, 1893, when E. L. Deheny, with pick and shovel, sunk a test or "wild cat well," a shaft 4 by 6 feet, and dipped up four barrels daily from a depth of 160 feet, to the present time, when a forest of derricks meets the eye, has been watched with interest. The speculative phase has been succeeded by that of settled development.

There are now about 300 wells in operation or ready to be opened, covering a territory of about 40 acres, and practically no dry holes. It is safe to say that the aggregate output of these wells when pumped will reach at least 2,500 barrels per day of crude petroleum of an average gravity of 15°. The average cost of a well is not far from $1,500, including pumps, tanks, etc., aggregating an investment of not less

than $450,000 in wells. This is rapidly being increased by additional wells.

Two pipe lines are now completed from the field to the railway tracks, each about 4½ miles, one company having a 32,000-barrel storage tank, the other a 35,000-barrel tank, and these lines have cost not far from $70,000. Pumping plants, delivery tanks, horses and other adjuncts have brought the actual investment in the industry up to as much as $600,000. Many good authorities place it as high as $750,000. The assessment of property in the oil district is placed at about $150,000 greater than it was in 1894, the greater portion being placed on the land. The residence improvements have been largely reduced.

While the refinery is of small capacity and experimental in its nature, it has been able to show, however, that there is not only a fuel supply, but that a lubricant as good as the best can be produced.

It is impossible to ascertain exactly just how much oil is being consumed in Los Angeles and contiguous territory, but it approximates 1,500 barrels a day. The Southern California Railway Company now has 11 engines under oil service, and is equipping others as rapidly as they can be spared. The street railroads, the breweries, laundries, iron and steel works and printing offices are also large consumers. The brick yards have been slow to adopt it, but are now rapidly being fitted with oil burners. They will largely increase the local demand, and 1,800 barrels will be about the daily consumption.

The experience of railroad companies is that 4 barrels of oil, or a little less, are equal to a ton of coal; and some consumers say 3 barrels will equal in units of heat a ton of coal. Taking the first estimate as a basis, the 1,800 barrels consumption takes the place of 600 tons of coal, costing about $4,000, all of which, less the middle man's profit, has gone away from here. Now the same heat is secured for $1,350 per day, all of which remains at home, and not less than $600 to $800 is being daily paid to the men employed in the oil field.

A pipe line to the coast is already promised by parties able to carry it into effect. An oil-carrying steam schooner is being built in San Francisco, and that market will soon be supplied with fuel from here.

The question then again arises, "What does this mean to Los Angeles, even in a single year?" Indications do not point to a falling off on the collective yield of oil, neither depreciation in quality nor diminution in quantity. The 600 or 700-foot wells contain the light oils, and show a depreciation in quantity of about 25 to 33⅓ per cent. in the last nine months. These are being deepened to the third sand stratum, which lies at a depth of 900 to 1,130 feet. There is also a falling off in the yield of some of the old wells in the vicinity of Second Street Park, but this is not surprising. It would be remarkable if it were not so, when wells are sunk within a few feet of each other, and only an average depth of 775 feet. In the Eastern States one well to five acres is considered a judicious allotment. Wells on Triumph Hill, Venango County, Pa., where the sand stratum is 125 feet thick, have been pumped for 15 years. Here we have a stratum we know is more than 300 feet thick.

Larger companies, representing more capital, are coming into the enterprise continually, and new fields are being prospected. Experts say that in all probability the oil belt stretches all along the range of hills from the vicinity of Westlake Park to East Los Angeles.

Sutherland's Coin Gas Meter.

English letters patent have been issued to Mr. Andrew Guthrie Sutherland, of Kensington Park, London, for improvements in automatic or prepayment gas meters. Using the words of the specification:

This invention consists of improvements in the mechanical details of coin gas meters and of arrangements whereby coins of different values can be used.

Fig. 1 shows the upper part of a meter, in partly sectional elevation, with the front plate removed; Fig. 2 is a sectional plan of the mechanism on the line $x\,x$ of Fig. 1; the other Figs. show details.

Though applicable to wet meters, the invention is preferably used in connection with dry meters.

A barrel or drum A is carried loosely on a spindle B, the drum bearing a scale upon the periphery, visible through a suitable opening in the case, so as to show the amount of gas to be consumed for one payment. The motive power is obtained from the crank spindle C. This spindle is fitted with a worm D, gearing into a toothed pinion E, fast on a spindle F. The spindle F carries another worm G, gearing into the toothed wheel H, fast on the spindle B; a spring J being fitted between the toothed wheel H and the drum A in such a manner as to cause sufficient friction to drive the drum. The drum A revolves during the whole time that the meter is working and gas passing. A ratchet wheel K is mounted loosely upon the spindle B, and is fixed to and concentric to the drum A. Two sectors, $L\,L$, are pivoted to the spindle B, so as to form caliber points, which by means of the connecting rods M, linked to the sectors and to a travelling nut N, may be set nearer to or farther from one another, so as to decrease or increase the space through which, or through part of which an arm (also concentrically carried, and having a spring-controlled or weighted pawl P engaging with the teeth of the wheel K) reciprocates. As shown in Figs. 1 and 2, the caliber plates L may be operated on the outside of the case or gallery plate by means of the milled-headed spindle Q, having a worm R, meshing with a pinion S, fast on the screw spindle T, carrying the travelling nut N. When the screw spindle T is turned in one direction the caliber plates L approach each other, and when turned in the opposite direction they recede from each other. In order to prevent this part of the mechanism being tampered with, the opening in the case may be suitably arranged to receive a wax seal, padlock, or equivalent device, so that the screw cannot be surreptitiously turned without it being found out.

The coin is inserted through a slot U in the case or gallery plate, and falls on to a cradle or other receptacle V, fast on the spindle W, within the case, and operated by a draw bar or plate outside the case also fast on the spindle W, and fitted with a knob or handle X, so arranged as to cover the slot U when in its normal position of disuse. When it is desired to obtain, say, one pennyworth of gas, the handle X is pulled forward, as shown in Figs. 1 and 3, returning the lever Y to its normal position by the catch Z, and the penny is inserted, falling into the cradle frame V. The knob X is then pushed back and the penny is carried backward by the frame V, which is fast on the spindle W, the penny sliding on the fixed plate A' until it arrives at an opening at the back, through which it falls. On its passage from front to back, the penny engages with the lever Y, which is pivoted loosely on the spindle W, the penny coming in contact with a projection B' on the lever Y, which is moved backward by the penny a certain distance, until it drops out of the cradle frame V. The fixed frame, A', is formed with ratchet teeth C' (Fig. 2), for preventing the handle or knob being returned before the completion of the full throw of the cradle.

In order to prevent gas being obtained surreptitiously, an inclined face, D' (Fig. 2), is formed on an extension of the cradle frame V, so that when the knob X is given its full throw, and allowed to remain in that position, the inclined face lifts a rod E' (Fig. 3), pivoted at F'. This rod lifts a catch bar G' out of contact with the tangent arm H' of the usual gas meter mechanism, and allows the same to travel. If the knob is not given its full throw the catch bar will not be raised, and will, consequently, arrest the motion of the arm H, and prevent gas being supplied, although the supply valve may be open.

A wire is fixed upon the fixed plate A', to prevent halfpennies falling through before the completion of the full throw of the cradle, the wire holding the halfpenny against the serrations. The construction of the lever Y is shown in elevation in Fig. 1, and in plan in Fig. 2. There is a slot J' in the lever Y, in which a pin K', attached to the lever O, works. A boss on the lever Y carries a finger L', which works in the fork of a bell-crank lever M', for actuating the cash indicating mechanism shown in elevation in Fig. 1. The other end of the lever M' carries a fork, in which a pin N' engages. This pin is attached to a pawl O', and ratchet wheel P', attached to a spindle Q', upon which an index hand is fitted, in combination with a dial, to indicate the pence or halfpence. The spindle Q' is fitted with an arm R', working in a fork S', which works a pawl T', and ratchet wheel U', on the spindle V'; which spindle is fitted with an index hand to indicate shillings. In like manner the spindle V' is fitted with similar appliances to operate the spindle W', an index hand attached to it being fitted to indicate pounds.

When the knob X is moved backwards into the position shown in Fig. 4, after the insertion of the coin, the lever O is carried backwards by the pin K' of the lever O. The pawl P, attached to the same lever, carries back the wheel K a certain distance by engaging its ratchet teeth. This distance and the number of ratchet teeth operated upon depend upon the relative positions of the sector caliber plates L, which throw the pawl out of gear with the ratchet teeth of the wheel when in contact with the pawl. The pawl P is preferably formed with a projecting contact piece, which, coming in contact with the curved edges of the caliber plates, causes the pawl to be thrown out of gear with the ratchet wheel K. The number of cubic feet of gas delivered in return for the coin is limited by the distance apart of the caliber points L.

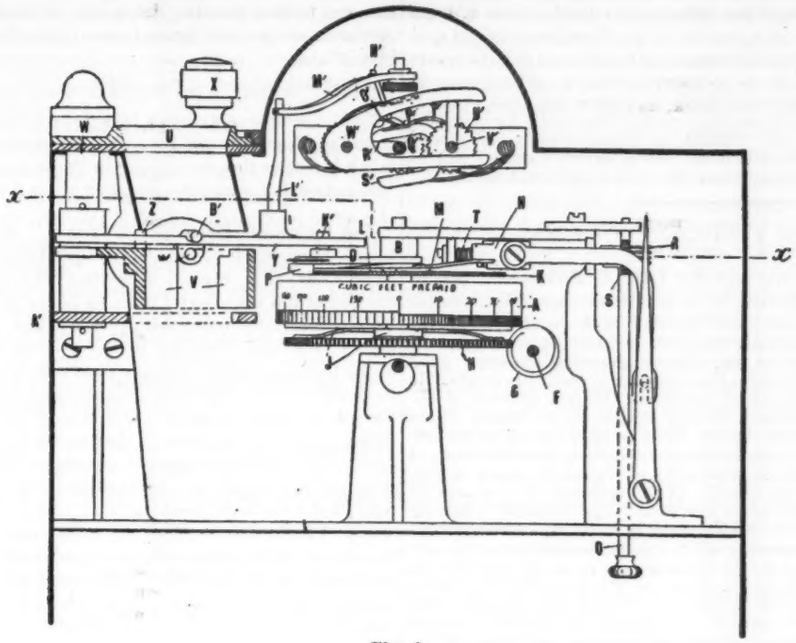


Fig. 1.

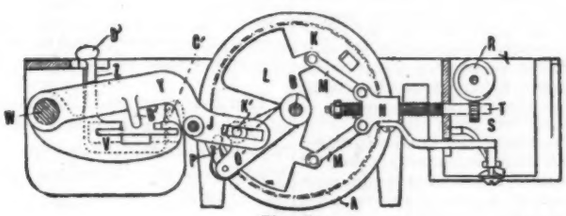


Fig. 2.

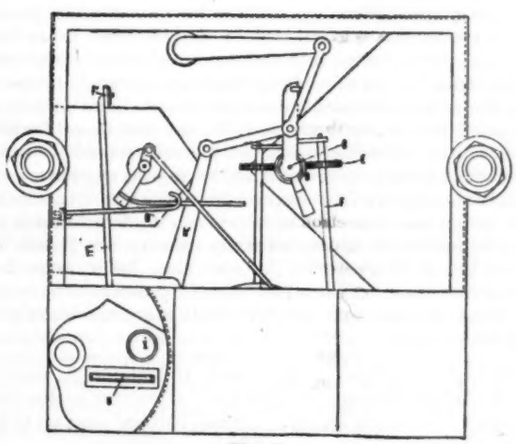


Fig. 3.

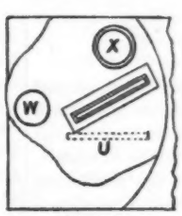


Fig. 4.

Fig. 5.

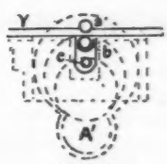


Fig. 6.

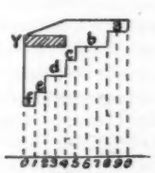


Fig. 7.

Fig. 8.

The valve operating mechanism may be of any suitable construction, but a special arrangement is described.

After performing its function, the penny drops out of the cradle into the receptacle provided to receive it; the cradle frame being hung upon the same center as the lever *Y*, the coin operates the mechanism throughout its travel, as hereinbefore described. Should a halfpenny be inserted instead of a penny, it will engage with a lower portion *Y'* of the lever, so arranged that the movement of the handle *X* and cover plate will only move the pawl *P* and toothed wheel *K* through a distance equal to one-half of that which it would receive if a penny had been inserted.

The mechanism may be arranged to operate with coins other than those before mentioned or in addition thereto, and the proportions may be varied, as it is not necessary that one coin should be twice the value of another. For example, Fig. 5 is a cross-sectional view of the lever *Y* and Fig. 6 a front view, showing the lever adapted for use with pennies, halfpennies and farthings; *a* is the projection for the pennies, *b* for the halfpennies, and *c* for the farthings. These points or projections are regulated to the exact proportion of the travel of the lever; for instance, the projection *a* for pennies moves a distance equal to the whole travel of the lever at this point; the projection *b* for halfpennies moves a distance equal to one-half of the last mentioned travel; and the projection *c* for farthings moves one-quarter of the travel of the projection *a* for pennies. It will be understood that the variations of the diameters of the coins in conjunction with the relative positions of the projections operate the mechanism in their proper proportions, and as all the coins slide on the same fixed plate or guide *A'*, the variations in the diameters of the coins prevent them engaging with any but their proper projections. In all cases the cradle is suitably slotted to accommodate the projections for larger coins than that inserted in the slot. For instance, when, say, a farthing is inserted the cradle carrying the farthing is moved up to the projection *c*, which engages with the farthing; but the other projections *a* and *b* protrude through and over the cradle.

Figs. 7 and 8 show the projection arranged to take 5s. pieces at *a*, 4s. at *b*, 2s. 6d. at *c*, 2s. at *e*, 1s. at *f*, and 6d. at *g*. These proportions may be obtained as follows: Divide the travels of the lever at this point into 10 equal parts; then as the whole, or 10-10ths of the travel, is the travel of the 5s. piece, it is clear that each tenth represents 6d., and the divisions, as marked off in Fig. 7, are thus readily obtained; for instance, 4s. equal 8-10ths, 2s. 6d. equal 5-10ths, 2s. equal 4-10ths, 1s. equals 2-10ths, and 6d. equals 1-10th, the drum being suitably geared to suit the amount of gas to be obtained from the coins of different values.

The Electrical Production of Carbon.

It has been recently shown, says the London *Electrician*, that at the highest temperature attainable in an electric furnace, all substances other than carbon are dissipated and removed, with the result that the ends of the electrodes are not only graphitic but are also sensibly pure. It follows that a carbon plate or rod, of dense graphitic structure, good conductivity and unusual freedom from impurity, should be producible by exposing the ordinary moulded article to the temperature of the electric furnace. This is precisely the direction in which Messrs. Street and Girard have been working. They claim to have succeeded in producing a form of carbon the conductivity of which is fourfold that of the untreated material, while its resistance to chemical action is also much enhanced. Taking the density of an ordinary carbon before heating as 1.98, they find that after treatment it has attained a density of 2.6. Should this figure be corroborated, it must be considered remarkable, inasmuch as the density of graphite obtained by ordinary means is not higher than 2.3, while the same figure has been observed as a maximum for hard gas carbon. Analysis of the carbons thus made indicated that the percentage of carbon transformed into graphite was about 80 to 85 per cent. The method of analysis is, however, by no means beyond criticism, depending, as it does, on the conversion of the graphite into the highly indefinite body known on the *lucus a non lucendo* principle as graphitic acid, which in no way resembles graphite, or comports itself as an acid. This point, however, may safely be left for future settlement. The precise percentage of graphite is not of moment provided a product has been obtained possessing many of the properties that would be exhibited by a sound coherent block of that form of carbon. When once criticism is allayed by the appearance, in a marketable form, of carbon which is nearly free from other elements than C, and neither oxidizes easily nor irregularly, nor breaks up when used as an anode for aqueous or igneous electrolysis, an ample field of application will at once be open. To take one of the most pressing cases alone: It is notorious that next to the want of a good diaphragm the most urgent need of those interested in commercial electrolysis has been a reliable, unattackable anode.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

SINCE the Springfield (Mass.) Gas Company has extended its mains to and through the adjoining borough of West Springfield, it has secured 50 consumers thereon. The prospect, too, is that the number will be doubled before the Christmas holidays.

ON the 12th inst. a hearing was given at Malden, Mass., by the Board of Gas and Electric Light Commissioners, on the petition of certain residents, who alleged that the gas rate charged by the Malden and Melrose Gas Light Company was excessive and should be amended. City Solicitor Orrin H. Carpenter represented the city; the petitioners were counselled by Mr. F. D. Allen, of Lynn; and the Gas Company's case was championed by ex-Governor William E. Russell. The first witness was Ald. Jordan, who, in response to questioning by Mr. Russell, said he did not enow that Mr. Cushing, who is prominent in the present agitation of the gas question, was interested in the concern known as the Citizens Gas Company; nor did he know that Mr. Allen, the legal adviser of the present complainants, was to have been President of the Citizens organization. In a general way Ald. Jordan and Messrs. Wm. Knollin, L. O. Ball and C. A. Charles then testified that there was a general demand for lower gas rates in Malden; and Mr. Ball further volunteered an expression of his belief that "if the rates were lowered the Company would increase its output largely." Mr. Russell followed with a well-balanced argument, in which he recited the history of the Gas Company, from the time of its organization in 1855 to the present day. He explained that the present dividend was only at the rate of 6 per cent. per annum, and that taking into consideration the output per mile of main, the current selling price was as reasonable as any charged in the State. In 1894, through an agitation similar to this, the Company was directed by the Board of Gas and Electric Light Commissioners to reduce its rate from $1.80 to $1.60 per 1,000 cubic feet, which recommendation had been followed. Since 1894 the market prices for oil had been sharply advanced, as also had the prices for main pipe, manufactured iron and clay goods, wherefore an order to reduce gas rates from those which were adjudged equitable in 1894 would not only be a hardship on, but absolutely an injustice to the Company. After some further desultory argument the hearing was adjourned to the 30th inst., when it will be continued in the Commissioners' rooms at the State House.

"ISAG," writing to the JOURNAL, from Dallas, Tex., says:

To the Editor AMERICAN GAS LIGHT JOURNAL: Inclosed was cut from the *Times-Herald* for your amusement and edification. Don't think hereafter that everything in Texas is always on the shoot, for you will notice that sometimes things dart, as it were.

THE inclosure referred to by "Isag" is as follows: "Under the head, 'Electrolysis of Pipe,' the Superintendent of the Dallas Water Works, Mr. J. M. Strong, in his report for the fiscal year says: Electrolytic action upon water pipes by trolly earth currents has become a very serious question to managers of water plants in cities where the electric overhead wires are used for street car purposes, and the rails of the track are used for return conductors, however well the rails may be bonded. This department has already experienced some trouble on the service connections on Elm and Main streets from electrolysis. Sewer pipes only one year in the ground have been honeycombed and destroyed. Just how much of this destruction is chargeable to electrolytic action I cannot say, as there are evidences of alkaline action as well; but I feel safe in saying it is largely due to electric earth currents. The Griffin street supply main passes near the power house of the electric light and power plant, and is subject to be used as a return conductor for all the electric earth currents in their return to the generators at the power house. I have been unable to maintain a perfect remedy and preventive to this destructive action of electricity upon water pipe. It is as yet a problem unsolved by engineering skill. The best that can be done when such service is permitted to be used is to require the street car companies to put in ample return wires at such points as may be required to fully transmit the return currents. I invite your serious consideration of this subject."

THE Rochester (N. Y.) *Herald* says that so many of the inhabitants of the adjoining town of Clyde are using gas, being led thereto by the charms of the Welsbach burner, that the Clyde Electric Company contemplates a cut in its selling rates to retain the customers who still are served by it.

THE Syracuse (N. Y.) *Herald*, of the 14th inst., says: "Certified checks aggregating $15,000, and made by the men to whom the illuminating gas franchise was granted by the Common Council three months ago, were deposited with the City Treasurer this afternoon in compliance with the provision of the franchise which is to the effect that in order to make the franchise operative the sum named above must be paid to the city by September 16th, and that a bond for $25,000, that the Company will restore the streets to proper condition where they are disturbed in the laying of mains and saving the city harmless from accidents be also filed within a specified time. The City Treasurer issued a receipt for the money paid. Those to whom the franchise was granted, and who paid $1,875 each into the city treasury, are Messrs. Frank Hiscock, Chas. M. Warner, W. B. Kirk, Thos. Ryan, John Dunfie, Jas. S. Gordon, Ham. S. White and George Doheny. The bond for $25,000, which was also filed with City Clerk Stevens, is also signed by the eight men named."

THE borough authorities of Hasbrouck Heights, N. J., seem indisposed to favorably consider the application of certain parties to pipe "the Heights" for a gas supply. "Small politics" appears to be the restraining impulse.

MR. ALBERT R. WILLARD, Supt. of the Greenfield (Mass.) Gas Light Company, while attempting to pass between the tracks of the local railroad depot the other day, received severe injuries. He essayed to pass the cars while the process of making up a freight train was in progress —"passing the cars" in this instance means his trying to cross over the couplers between two cars when the train was at a standstill—but the engineer suddenly backed in order to take up the slack, and Mr. Willard's right foot was badly crushed. It is feared that the injured member will have to be amputated.

THE Ansonia (Conn.) Brass and Copper Company uses industrial railways, of 21½ inches gauge, designed by the C.W. Hunt Company, New York. The Thorndike Company, of Thorndike, Mass., has also installed the Hunt system of narrow gauge railways for handling materials in its works.

THE Berlin Iron Bridge Company, of East Berlin, Conn., has just completed for the George W. Stafford Mfg. Company, of Providence, R. I., a new machine shop 50 feet wide and 174 feet long, two stories

high. The building is constructed of brick and iron, and is so designed that two additional stories may be added in the future. The Bridge Company has also just finished a new car barn for the New Haven Street Railway Company. The building is 86 feet wide and 188 feet long, with a slate-covered roof.

THE Commissioners of the District of Columbia have amended the building regulations for Washington in respect of the placing of small motors in buildings, the section of the regulations referring thereto being as follows: "Engines and boilers for driving machinery, for grinding coffee, spices, or for other similar purposes in stores, or for elevators in hotels, stores and warehouses, where under 10-horse power, or for heating purposes, or gas or electric motors, may be permitted under such restrictions as the inspector of buildings may direct in each case, upon the notice in writing, by the owner or agent intending to set up such boiler or engine, to the inspector of buildings, fully describing said boiler or engine, and the use for which it is intended, but not until a special permit shall have been obtained."

SECRETARY L. F. BURGER, of the Mahoning Gas Fuel Company, of Youngstown, O., has given notice of an increase in the rate for natural gas, the schedule to take effect October 1st. The advance, roughly stated, amounts to 10 per cent.

THE Tucson (Ariz.) Gas Company seems to have taken on a new lease of life. In any event, handsome offices have been secured in the National Bank building, the gas rate has been reduced, and the sale of gas cooking and heating apparatus is being pressed.

AT the stockholders' meeting of the Tonawanda (N. Y.) Gas Light Company, a proposition to expend $9,000 on plant betterment was adopted. The Trustees elected were: A. G. Kent, J. H. De Graff, Joseph Wolf, Martin Riesterer, Chas. Weston, Christoff Schwinger and L. G. Stanley.

THE Fort Wayne (Ind.) Gas Company has arranged for several miles of main extensions.

ACCORDING to the annual report of Mr. Ford, Inspector of Gas and Meters for the District of Columbia, the illuminating value of the gas supplied by the Washington Gas Light Company during the year equalled 19.63 candle power, an increase of 1.61 candles over the average for last year. No defaults occurred during the year in respect of illuminating power or impurity content. He also says that the illuminating value of the gas sent out by the Georgetown Gas Light Company averaged 16.97 candles, and suggests that that Company be required to either provide a coal for manufacturing gas from which its purifying apparatus will remove the sulphur within the limits prescribed or enlarge the purifying capacity of its plant. During the year 2,713 meters were inspected and proved. Of this number 249 registered fast—average error, 4.20 per cent.; 61 registered slow—average error, 4.63 per cent.; 2,394 registered within the limits prescribed—namely, 2 per cent. either way, and 3 did not register the gas flowing through them; 591 of the above were ordered out and inspected and proved on complaint; 580 were complained of by consumers, and of this number 238 registered fast, the average error being 4.43 per cent.; 59 registered slow, with an average error of 4.96 per cent. The Inspector recommends that the Washington Gas Light Company be required to send to his office all meters removed by it from the premises of consumers for the purpose of determining whether the meter is registering correctly.

THE following is from the Toronto *Empire*, dated Sept. 10th:

Mr. Justice Ferguson gave judgment at Osgoode Hall yesterday in Johnston vs. Consumers Gas Company, of Toronto, an important case heard before him in the weekly court in May last, upon a special case stated by the parties. The plaintiffs are Mr. J. T. Johnston and the Toronto Type Foundry Company, suing on behalf of themselves and all other consumers of gas furnished by the defendants in the city of Toronto. The action was brought to obtain a declaration of right and an account. The defendants were incorporated in 1848. In 1887, being desirous of increasing their capital stock, they presented a petition to the Legislative Assembly of Ontario for authority to do so, and thereupon an Act was passed in that year, entitled "An Act further to extend the powers of the Consumers Gas Company, of Toronto," which came into force on the 23d of April, 1887. It was alleged by the plaintiffs that at the time of the passing of this Act the defendants had a surplus of profits on hand which was to have formed the nucleus of the rest or reserved fund, which at that time amounted to $394,310. The plaintiffs alleged that the defendants then sold the increased capital stock at a premium, and thereby realized a large sum, which, they charged, should have been added to the reserve fund and invested in some one or more of the securities mentioned in the fourth section of the Act, but, instead of so investing it, the defendants invested it in plant and material. The plaintiffs also charged that the defendants made large profits in their business since 1887, amounting to about $250,000, which should have been applied by the defendants in forming the special surplus account to be used in the reduction of the price of gas to the plaintiffs, and also that the interest which would have been gained if the reserve fund had been invested should also have been applied in reducing the price of gas to consumers. The plaintiffs also alleged a further sale of new stock by the defendants in Oct., 1893, which realized a premium of $83,040, which sum the defendants, as the plaintiffs feared, would, unless enjoined, use in the purchase and construction of plant, as also such fresh profit as might accrue from time to time. The plaintiffs claimed a return of sums that they said had been overpaid by them to the defendants as the price of gas consumed, and asked for an account of the receipts and disbursements of the defendants since the 23d March, 1887; a mandatory order directing the defendants to comply with the provisions of the Act of 1887; a declaration of right; a declaration that the defendants are trustees, etc., and an order restraining the defendants from misapplying the $83,040. The defendants, by their defence, raised the question of the proper construction of the statutes relating to their rest or reserve fund, etc., and said they had reduced the price of gas. They also demurred to the statement of claim on the grounds that the plaintiffs had no locus standi to bring the action.

The first question which the special case asked the court to answer was whether the plaintiffs had a right to maintain the action as constituted. This question the court now answers in the affirmative.

The second question was whether the defendants were obliged to include in the rest or reserve fund which the Act of 1887 directed them to have: (a) the moneys which the defendants had standing to the credit of profit and loss account; (b) to the credit of contingent account at the time of the passing thereof; and (c) all the money received from the premiums on the sale of stock authorized by the Act to be sold until the fund amounted to 50 per cent. of the paid-up capital. The answer of the court to this question is also in the affirmative.

The third question was whether it was ultra vires of the Company to invest or use the reserve fund or any portion of it in the purchase or construction of their plant or buildings or in their business generally. Answered, that it was ultra vires.

Fourth question—Was it ultra vires of the Company to invest the premiums on the sale of stock or any part thereof in the erection of buildings until the rest or reserve fund had been found equal to one-half of the paid-up-capital? Answer in the affirmative.

Fifth question—Did the defendants establish, maintain, invest, and use the rest or reserve fund in accordanee with the provisions of the Act? Answer in the negative.

(Sixth question, not necessary to answer.)

Seventh question—Has the plant and buildings renewal fund ever been created or maintained within the meaning of the Act? Answer—It does not appear that this fund has been created or maintained as required by the 6th section of the Act.

Eighth question—After providing for all usual and ordinary repairs and renewals, was it ultra vires of the Company to invest or use the surplus of the plant and buildings renewal fund in their general business, or was the fund to be kept separate from the other moneys of the Company uninvested?

Ninth question—If the usual and ordinary repairs and renewals did not amount to as much of the 5 per cent. referred to in the Act, should the full 5 per cent. be carried to the credit of the plant and buildings renewal fund, or only sufficient to cover the usual and ordinary repairs? Answer—There is no objection to the investment of any portion of this fund, remaining unemployed, in such securities as would be readily available in case the funds should be required, but there is no obligation resting upon the Company so to invest.

Tenth question—In addition to keeping the plant and buildings in repair by means of this fund, has the defendant Company the right to write off sums of money from profits by "depreciation in plant?" Answer in the negative.

The judgment is therefore in favor of the plaintiffs directing the taking of several accounts, comprehending the whole business of the defendants done since the passing of the Act of 1887, and including the surplus profits then in the hands of the defendants. For the purpose of taking these accounts a reference is directed to the Master-in-Ordinary. The plaintiffs are to be paid their costs to the present time by the defendants. Further directions and subsequent costs are reserved.

THE Company will appeal the case.

THE AMERICAN GAS LIGHT JOURNAL

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PROPRIETORS.

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AGENTS:

New York—American News Co., 39 and 41 Chambers St.
Germany—B. Westermann & Co., of New York.

MONDAY, SEPTEMBER 23, 1895.

The Market for Gas Securities.

There was no change of moment in the market for city gas shares during the week, although it may be said that, despite a most erratic market for common shares—meaning shares on the general list of the Exchange—gas securities more than held their own. Consolidated sold to-day (Friday) at 144, and we believe (in fact, we know) it is cheap at anything this side of a 5 per cent. basis. Will investors remember this fact? The present government of the State is in fair accord with its manufacturing interests, and not the least of these is the gas interest; and when we say "fair accord," we mean the State authority now reigning prefers to see honest industry protected from assault rather than that industry should seek protection by half-hearted contributions to "political assessment" account for either or any "party."

The Standard Company is issuing some of the treasury stock, which we rather think was formerly controlled by Mr. Andrews, shareholders of record having the right to take a proportionate part at half price—50, that is.

The Brooklyn situation is still muddled; but we have no occasion to take anything back that we said last week respecting it. The ultimate result will, after the deadheads are sifted, appear quite like our forecast.

The feature in out-of-town shares was Chicago gas, which sold above 70 and then slumped to 68 and a fraction, all in the course of a short morning. It is said that a legal way out of the Chicago Company's troubles has been formulated; we hope so. It is also said that a dividend will be distributed. Beyond a doubt this is so; and we further believe that the rate per annum will be 5 per cent. Lacledes are fairly strong, and Consumers, of Jersey City, is an undoubted purchase.

Gas Stocks.

Quotations by Close & Nash, Brokers and Dealers in Gas Stocks.

35 WALL ST., NEW YORK CITY.

SEPTEMBER 23.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$35,480,000	100	143¾	144
Central	500,000	50	150	..
" Scrip	220,000	..	100	..
Equitable	4,000,000	100	195	..
Bonds, 6's	1,000,000	1,000	106	..
" 1st Con. 5's	2,300,000	1,000	113	115
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	173	..
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	..	..	.
Northern	150,000	50	90	91
" Bonds	150,000	1,000	..	98
New York and East River	5,000,000	100	31	33½
Preferred	2,000,000	100	53½	55½
Bonds	3,500,000	1,000	92¾	93¾
Richmond Co., S. I.	348,650	50	50	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	70	..
Preferred	5,000,000	100	108½	..
Bonds, 1st Mortgage, 5's	1,500,000	1,000	109	..
Yonkers	299,650	50	112	..
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	125	..
Citizens	1,200,000	20	65	..
" S. F. Bonds	220,000	1,000	..	101
Equity	2,000,000	10	..	..
" Bonds	1,000,000	..	..	..
Fulton-Municipal	3,000,000	100	175	..
" Bonds	300,000	..	103	..
Peoples	1,000,000	10	90	.
" Bonds, 7's	368,000	..	100	..
" " 6's	94,000	..	98	100
Metropolitan	870,000	100	170	..
" Bonds, 5's	70,000	..	..	..
Nassau	1,000,000	25	225	..
" Ctfs	700,000	1,000	99	100
Williamsburgh	1,000,000	50	210	..
" Bonds	1,000,000	..	107	110
Out-of-Town Companies.				
Bay State	5,000,000	50	19¼	20⅛
" Income Bonds	2,000,000	1,000	23	..
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	..	80
2d " " "	3,000,000	1,000	51	55
Buffalo Mutual	750,000	100	125	..
" Bonds	200,000	1,000	95	100
Central, San Francisco	.....	..	95	..
Chicago Gas Co.	25,000,000	100	69½	69¾
Chicago Gas Lt. & Coke Co. Guaranteed Gold Bonds.	7,650,000	1,000	93	93½
Columbus	1,069,000	..	63	66
1st Mortgage	1,085,000	..	91	93
Consumers, Jersey City	2,000,000	100	91	93
" Bonds	600,000	1,000	100	105
Cincinnati G. & C. Co.	7,000,000	100	204	205
Consumers, Toronto	1,600,000	50	184½	187
Capital, Sacramento	.....	.	..	41
Consolidated, Baltimore	11,000,000	100	63¾	63¾
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490,000	..	..	..
Detroit	4,000,000	..	30¾	..
" Con. Bonds	4,312,000	..	75	..
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	72	74
" Bonds	2,000,000	..	85	..
Hartford	750,000	25	130	135
Indianapolis	2,000,000	..	150	155
" Bonds, 6's	2,650,000	..	105½	..
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind.	1,000,000	100	84	86
Bonds	1,000,000	1,000	88	90
Louisville	2,570,000	50	..	130
Laclede, St. Louis	7,500,000	100	29¾	30
Preferred	2,500,000	100	87¾	88¼
Bonds	9,034,400	1,000	97	97¼
Little Falls, N. Y.	50,000	100	..	100
Bonds	25,000	..	..	100
Montreal, Canada	2,000,000	100	200	..
New Haven	.....	25	225	..
Oakland, Cal.	.....	..	45	..
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	2,100,000	1,000	..	108
2d "	2,500,000	1,000	104	105

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As Supt. or Manager of a Gas Works or Gas and Electric Light Works.

Fifteen years' experience as Manager of Gas Works and six years Gas and Electric Light Works. Good reasons for wishing to change present employment.

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WANTED,

By a man who has had a round experience in the manufacture and sale of gas,

A Position as Supt. of a Large or Small Gas Works.

Is capable and energetic, and is willing to begin at a moderate salary. Address

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Utilize Your Gas Liquor.

NO EXTRA LABOR OR OPERATING EXPENSES.

Ammonia Concentrator.

Not Expensive. Write to

STROH & OSIUS, Pat'ees, or

Mich. Ammonia Works, Detroit, Mich.

Get Our Prices on

Mica Chimeys

For Welsbach Lights,

AND ON

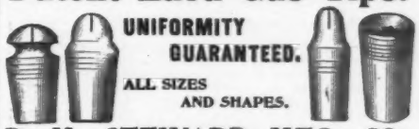
Mica Canopies.

The MICA MFG. CO.,

Micasmiths,

88 Fulton Street, - - New York City.

Patent Lava Gas Tips.



UNIFORMITY GUARANTEED.

ALL SIZES AND SHAPES.

D. M. STEWARD MFG. CO.,

CHATTANOOGA, TENN.

Read, Holliday & Sons, Ltd.

No. 7 Platt St., N. Y. City.

HYDRATED OXIDE OF IRON

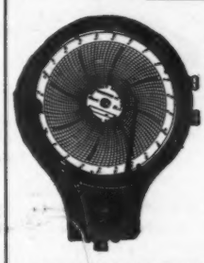
For Gas Purification.

Analysis, Samples and Particulars on Application.

BRISTOL'S RECORDING **PRESSURE GAUGE**

For Continuous Records of

Street Gas Pressure.



Simple in Construction,
Accurate in Operation,
Low in Price,
Fully Guaranteed.

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Waterbury, Conn.

Received Medal at World's Columbian Exposition.

Special Trays for Iron Sponge or Oxide of Iron.

CHURCH'S TRAYS a Specialty.

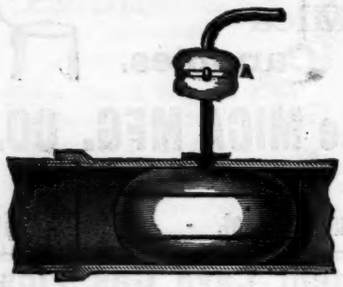
Reversible, Strongest, Most Durable, Most Easily Repaired.

506-310 Eleventh Avenue, New York.

We also make the Cheapest and Strongest REVERSIBLE BOLTED TRAYS IN THE MARKET

Send for Circulars.

Peerless Patent Improved Gas Bag



These Gas Bags are used to stop the flow of gas while repairing or making alterations in gas mains. There have been numerous cases of workmen being badly injured, and sometimes fatally, by the escape of gas resulting from the bursting of a bag, and our patent improvement is designed to obviate such calamities. The indicator *A* shows unerringly when the bag has been sufficiently inflated to pack the main, and when the pumping should be stopped. Our Bags are made of a rubber stock especially prepared to admit of great distension, and to resist the action of Oils, Gases, Naphtha and other residuum in the mains, and they are made with lapped joints, which adds greatly to their strength.

3-in. Gas Bag, each,	$0.60		12-in. Gas Bag, each,		$5.00
4 " " "	.80		16 " " "		8.25
5 " " "	1.05		20 " " "		12.00
6 " " "	1.75		24 " " "		17.00
8 " " "	2.65		30 " " "		27.50
10 " " "	3.75				

The Peerless Rubber Mfg. Co.
16 Warren St., N. Y. City.

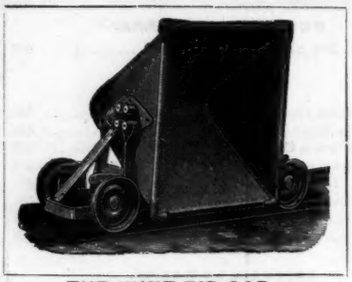
MOSES G. WILDER,
Mechanical Engineer,
816-822 Cherry St., Phila., Pa.

MANUFACTURER OF

Gas Governors,
Governor Gas Burners,
Gas Cocks and Fittings,

In addition to a full assortment of Volumetric Governors, etc., I am now making **MERCURY PRESSURE GOVERNORS** of all the usual sizes, adapted to use upon *Gas Stoves, Furnaces, and Meters*. The same careful attention to details of design and workmanship which has established the reputation of **WILDER'S VOLUMETRIC GOVERNORS** will be given to the new line. They have been thoroughly tested in many places during the past year, and have given entire satisfaction. The price is very low, and but for a complete system of machinery adapted to this work, it would be impossible to sell them at the price. I hope for large orders, as they become known, in consequence of the low price and good quality.

G. W. HUNT COMPANY.



THE HUNT TIP CAR.

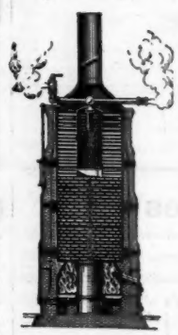
COKE CARS for Gas Works,
TIP CARS for Carrying Ashes,
CHARGING CARS for Bringing Coal from the Storage Bins to Boiler Room and Retort Houses.

INDUSTRIAL RAILWAYS
Specially designed for handling material in and around
Gas Works, Coal Yards, Factories, Etc., Etc.

45 BROADWAY, - - NEW YORK.

If You Want the Best GAS-TIGHT Tubing,
BUY OF THE
NEW YORK GAS TUBING CO.
334 & 336 East 23d St., N. Y.
GUARANTEED NOT TO STIFFEN. Makers of All Kinds of Flexible Tubing.

THE HAZELTON OR PORCUPINE WATER TUBE BOILER.



The Best Boiler in the World, and the Cheapest per Square Foot of Heating Surface.
Unequaled for the Economical Production of Very Dry Steam.
WE GIVE Liberal Capacity, Highest Efficiency, Absolute Safety and Thorough Workmanship.
WE SOLICIT the Critical Examination of the Mechanical Profession and the Steam-Using Public, and Your Trade.
Send for Catalogue and Reports of Tests.

The HAZELTON BOILER COMPANY,
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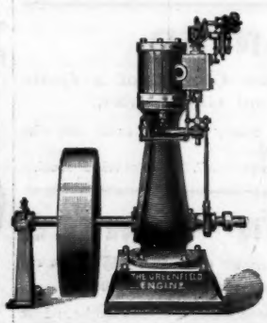
Cable Address, "Palla," New York. Tele., "1229-18th St.," New York.
Gen'l Office, 716 E. 13th St., N.Y., U.S.A.



GREENFIELD Steam Engine Works.
Established 1874.
MANUFACTURERS OF
Greenfield Stationary, Portable and Yacht
ENGINES AND BOILERS.
Also Horizontal, Automatic and Variable Cut-off Engines.
Sizes from 3 to 75 Horse Power.
Also Vertical and Horizontal and Marine Boilers.
Steam Pumps and Adams' Crate Bars.
W. G. & G. GREENFIELD, - - EAST NEWARK, N. J.

F. BEHREND,
SOLE IMPORTER OF THE CELEBRATED
German (Stettin-Didier) Clay Gas Retorts,
BLOCKS, TILES, FIREBRICKS, FIRE CEMENT,
Stettin "Anchor" & "Eagle" Brand Portland Cement
10 & 12 Old Slip, New York.

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Promptly secured. Trade-Marks, Copyrights and Labels registered. Twenty-five years experience. We report whether patent can be secured or not, free of charge. Our fee not due until patent is allowed. 32 page Book Free.
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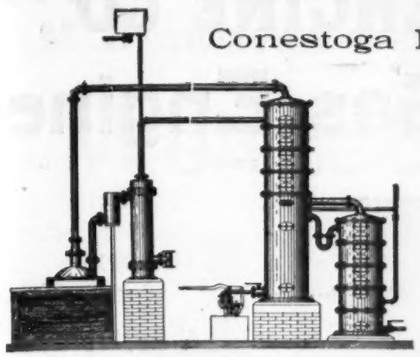
The Celebrated SHANER GAS COAL
CORRESPONDENCE SOLICITED.
Is Mined and Shipped from the Best Gas Coal Basin in Pennsylvania.
SHANER COAL CO., - 1326 Chestnut Street, Philadelphia.

GAS ENGINEERING COMPANY,

INCORPORATED,

Conestoga Building, PITTSBURGH, PA.



AMMONIA MACHINE.

MANUFACTURERS OF

Gas Works Machinery of all kinds,

PATENTEE AND OWNER OF

PITTSBURGH WASHER-SCRUBBER,

SOLE AGENT FOR

FELDMANN AMMONIA MACHINE,

For producing Sulphate, Aqua, Chloride and Concentrated Liquors.

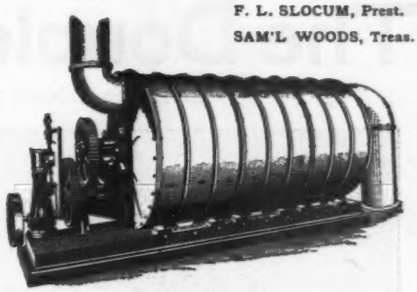
The Erection of Bi-Product Coke Ovens a Specialty.

Faux System of Recuperative Benches,

JAS. GARDNER, JR.
SOLE CONSTRUCTOR AND BUILDER.

NEW SYSTEM HYDRAULIC MAIN.

F. L. SLOCUM, Prest.
SAM'L WOODS, Treas.



SCRUBBER.

THOS. N. MORDUE,

Cannel Coal Merchant,

No. 1 Broadway, - - - New York City.

Exclusive Shipper of the following celebrated

GENUINE KENTUCKY CANNELS.

BRECKENRIDGE. The richest Cannel in the world; will yield 15,200 cubic feet of 46.20 candle gas per ton of Cannel.

O. K. BOGHEAD. Will yield 16,504 cubic feet of 38.15 candle gas per ton of Cannel.

BIRDSEYE. Will yield 14,132 cubic feet of 36.55 candle gas per ton of Cannel.

ALL PRODUCE EXCELLENT COKE.

Shipments in sealed box cars direct from the mines to any required station in the United States or Canada. Cargo Shipments from Newport News or Norfolk, Va. *Correspondence Solicited.*

BRAY'S PATENT "ENAMELED" GAS BURNERS.

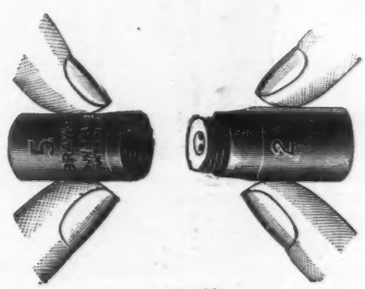
Bray's "Special" and "Adjustable" Burners

Are the Cheapest, Most Economical and Most Durable in existence, and will, at their REDUCED PRICE, save their cost in gas alone in forty hours' use.

Union Jet.

Slit Union.

Batswing.



Adjustable.

Made with Inside Screw to Suit American Fittings.

The "Specials" are made to Suit Low and High Pressures. The "Adjustables" consist of two Burners screwed together, the size of which can be arranged to suit any Pressure and Consumption. For full description see Catalogue.

See that **"Bray's Special"** or **"Bray's Adjustable"** is stamped on each kind of Burner.

ACETYLENE AND RICH OIL GASES.—We now make Burners suitable for use with these Gases.

TO BE HAD OF FACTORS THROUGHOUT THE STATES.

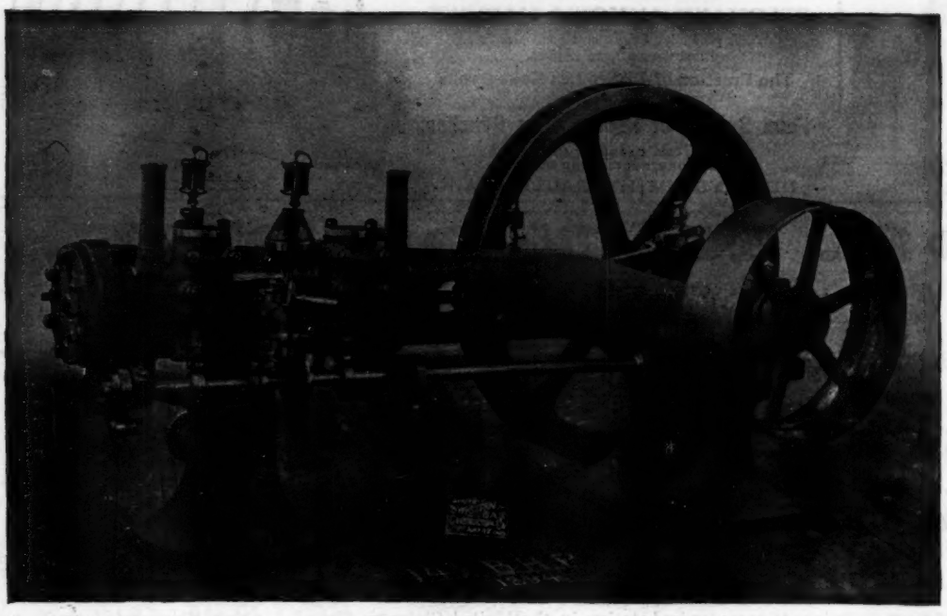
WM. W. GOODWIN, Prest. O. N. GULDLIN, V.-Prest. & Treas. H. B. GOODWIN, Sec. ERNEST F. LLOYD, Asst. Sec

THE AMERICAN GAS ENGINE CO.,

MANUFACTURERS OF

The Double-Acting Gas Engine,

Under the Patents of Griffin, and Dick, Kerr & Co., of London and Kilmarnock.



⁂

Single Cylinder.

Impulse Every Revolution.

(Two Strokes.)

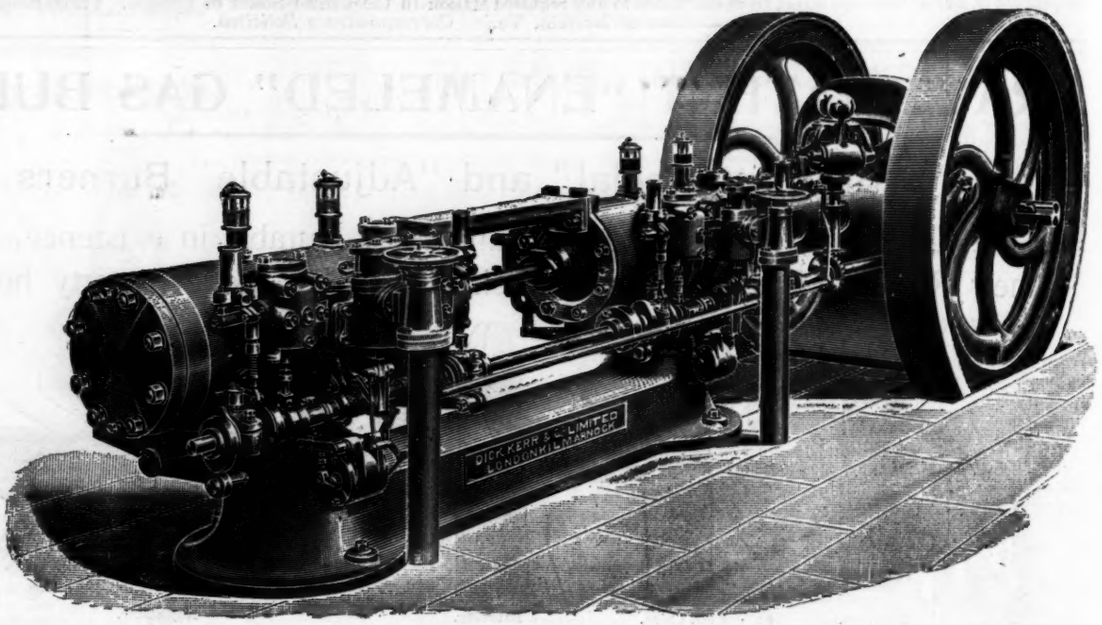
15 to 500 Horse Power.

For General Work and Isolated Electric Plants.

⁂

Tandem Cylinder. Impulse Every Stroke. 100 to 1,000 Horse Power.

For Central Stations and all work requiring extreme steadiness.

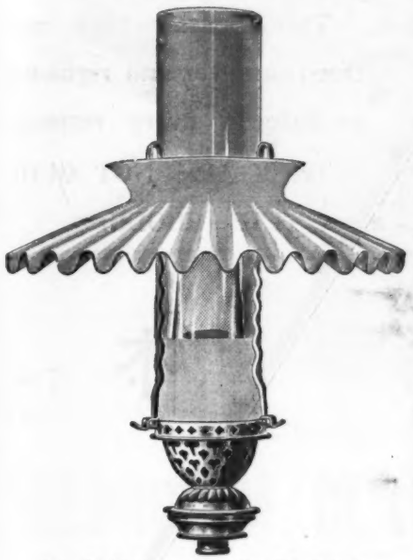


ESSENTIAL PRINCIPLE.—An impulse at each end of piston; using half force to each impulse; doubling the steadiness; reducing the wear on moving parts, and weight for given power. **CONSTRUCTION.**—The piston rod works through stuffing box in front end of cylinder, and connecting rod is carried in a cross-head working in a slide in frame, as in ordinary steam engine practice. All valves are of the poppet type, operated by cams on a single cam-shaft, giving positive movement to every working part. Tube or electric ignition. **RESULT.**—An engine of extreme simplicity and steadiness of action, the even wear on the cylinder and all working parts assuring increased economy, long life, and minimum cost in repairs. **RECORD.**—Successful and constant use in Great Britain for the past eight years. Address

W. W. GOODWIN, President, Lock Box 718, Philadelphia, Pa., or
THE WESTERN GAS CONSTRUCTION CO. Bldrs. & Gen. Agts., Fort Wayne Ind.

The Improved

Welsbach Light.



No. 31 Burner, with No. 74 Shade.

No. 31 Burner, with Nos. 10 and 43 Shades.

Made by the

Welsbach Light Company,

Gloucester City, N. J.

Sole Manufacturers for the United States.

The WOLFF Gas Radiator.

Size, 33 Inches High, 21 Inches Wide and 10 Inches Deep. The Trilby Heaters are furnished in Brass, Copper-Bronze and Nickel Plate.

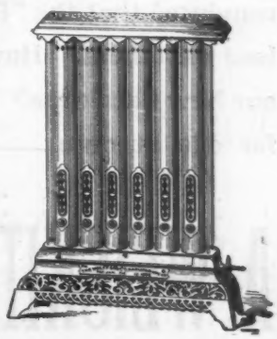
The Most Ornamental and Economical Gas Heater in the World.

The WOLFF Gas Radiators are no Longer an Experiment.

Heating with gas as a fuel instead of wood or coal was made practicable only four years ago, when the first WOLFF Gas Radiator was made. Since that time we have supplied Gas Radiators to heat all kinds of Rooms, Halls, Stores, Churches, Theaters, etc.; they are used in Bed Chambers, Sick Rooms, and wherever heat is required. And, because of their great success, several imitation Gas Radiators are offered, "said to be as good as Wolff's;" but none of them are as good. The WOLFF Radiator gives more and better quality of heat, at less cost, than any gas heater in the market.

In our Trilby Heater we again offer something **new, novel** and **good,** as well as beautiful and pleasing to the eye. Most Stoves, Heaters and Radiators in use heat the **top** of the room, leaving the **floor** cold (hence keep the head warm and the feet cold). Our Trilby Heater warms the floor first; then the heat rises gradually, warming the whole room comfortably, cold air being drawn in from the bottom (passing between the heated radiating flues) and thoroughly warmed before passing out at the top, while the gas, mixed with air, is burned in our "Patent Incandescent Iron Fires Burners," which greatly intensifies the heat, causing an extra amount of heat to be radiated, or thrown off onto the floor, while the products of combustion are carried up through radiating iron flues to the top of the Trilby Heater, and downwards and out through opening to flue or chimney pipe connection, making a current or outlet for burnt gas or impure air, thus causing perfect ventilation in the room.

The Trilby uses less gas and gives more and better heat than any other Gas Radiator in the market.



MANUFACTURED BY

THE WOLFF GAS RADIATOR MANUFACTURING CO.,

Office, 164 Franklin St., New York.

These are the Handsomest, Best Finished and Most Powerful Gas Heaters in the World. They give the greatest amount of Heat for the quantity of Gas consumed, therefore being the most economical Gas Heaters to use.

FIRE KING GAS RADIATORS

These Gas Radiators are no experiment. They were brought out last Season and an immense number sold, and every one gave perfect satisfaction. This Season they are better than ever and right up to date in every respect. THEY ARE NOT OLD-TIME GOODS.

THE BEST IN THE WORLD.

Made with 4, 6, 8 and 12 Tubes, and finished in either Nickel or Bronze.

We also have something new in the way of a Square Gas Heater, which is the handsomest Stove of the kind on the market. Send us an order for Samples and be convinced that the "FIRE KINGS" lead all others. Have you got our New Catalogue? If not, write for one at once.

The Patent Lighter Cocks used on these Radiators, which have also been improved for this Season, are the finest Cocks ever put on a Gas Stove. We manufacture all these Cocks ourselves out of the best Brass and by skilled labor, and they are not like the common Cocks now used on Gas Stoves, and bought from the man who makes them the cheapest.

A. WEISKITTEL & SON, BALTIMORE, MD.

JEWEL GAS STOVES

This is One of Eight New Ranges.

For 1895

ARE MODERN
AND
UP TO DATE.

Two New Laundry Stoves.
Six New Square Junior Stoves.

WRITE FOR 1895 CATALOG.

56 Cooking Appliances.
Not a Padded Book.

GEORGE M. CLARK & COMPANY, Makers, CHICAGO.

Eastern Agency, 152 & 154 West 23d St., N. Y. City.

WILLIAM M. CRANE & CO.

Office, 838 Broadway; Factory, 428 & 430 W. 14th St., NEW YORK CITY.

SEND FOR NEW CATALOGUE.

We Carry the Most
Complete Line of
Gas Appliances in the
Country.
Gas Fires, Gas Logs,
Fire Place Heaters,
Ranges, Broilers,
Laundry Stoves,

The New Vulcan Radiator. In 4, 6 and 8 Tubes.

SEND FOR NEW CATALOGUE.

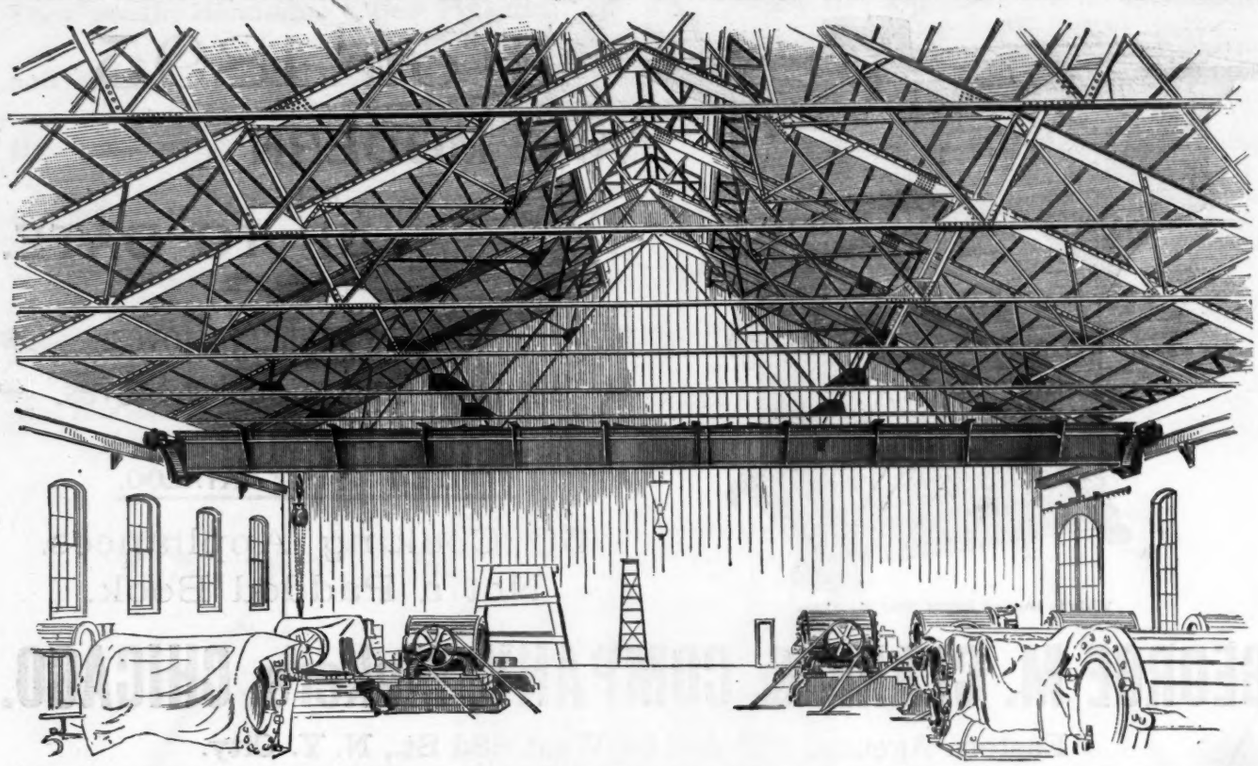
Tailor Stoves,
Soldering Furnaces,
Griddles,
Waffle Stoves,
Hot Plates,
Gas Kilns, etc., etc.
A New Line of
Radiators.

Send or Description of our NEW VULCAN Gas Furnace, for HOT AIR or HOT WATER.

Gas Controllers, Meter, and Service Cocks, Independent, and Hose Cocks, and Fittings of all kinds, with Extra Large Gas Way.

CHAS. M. JARVIS, Prest. & Chief Engineer. BURR K. FIELD, Vice-President. FRANK L. WILCOX, Treasurer. GEO. H. SAGE, Secretary.

THE BERLIN IRON BRIDGE CO.



The above illustration, taken direct from a photograph, shows the construction of an Iron Truss Roof, with a Traveling Crane, both of which were designed and built by us for the Narragansett Electric Lighting Company, at Providence, R. I. The illustration is taken in the Dynamo Room, which is 60 feet in width by 200 feet in length. The side walls are of brick, with iron roof trusses covered with our Patent Anti-Condensation Corrugated Iron. This is the first roof ever built with this Patent Anti-Condensation Corrugated Iron, and after passing through three severe winters has shown no signs whatever of any dripping or sweating on the Corrugated Iron. We guarantee this Anti-Condensation Iron Roof Covering not to drip in the coldest weather.

Write for Illustrated Catalogue.

Office and Works, No. 6 Railroad Avenue, East Berlin, Conn.

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MANHATTAN LIFE BUILDING,
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CABLE ADDRESS,
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"HUMGLAS."

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ENGLAND.

HUMPHREYS & GLASGOW,

CONTRACTING AND CONSULTING

GAS ENGINEERS.

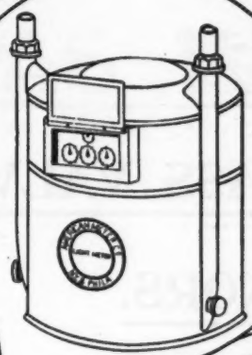
WATER GAS PLANT A SPECIALTY.
GAS PROPERTIES EXAMINED AND VALUED.
ADVICE AS TO IMPROVEMENT OF GAS PROPERTIES AND MANAGEMENT.

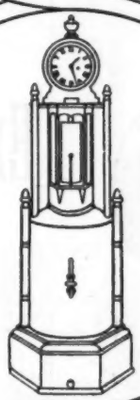
THE MANAGEMENT OF SMALL GAS WORKS.

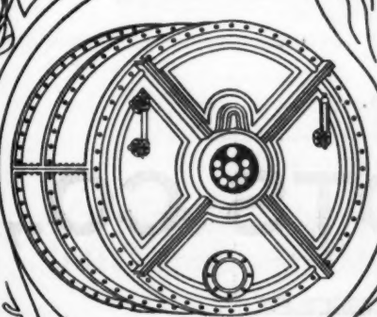
By C. J. R. HUMPHREYS.

Price $1.

A. M. CALLENDER & CO., No. 32 Pine Street New York







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AMERICAN METER CO.

ESTABLISHED 1834. INCORPORATED 1863.

NEW YORK AND PHILADELPHIA,

CHICAGO, ST LOUIS,

SAN FRANCISCO.

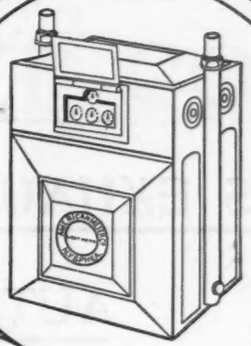
PUBLIC LIGHTING TABLE.

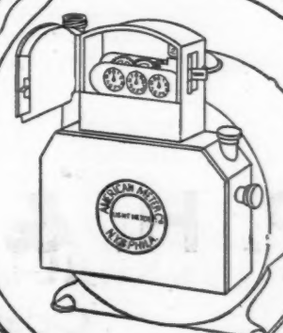
OCTOBER, 1895.

Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Tue.	1	3.40 AM	5.00 AM	5.30	5.00
Wed.	2	No L.	No L.	5.30	5.00
Thu.	3	No L. FM	No L.	5.30	5.00
Fri.	4	No L.	No L.	5.30	5.00
Sat.	5	6 00 PM	7.10 PM	5.30	5.00
Sun.	6	6.00	7.40	5.30	5.00
Mon.	7	6.00	8.10	5.30	5.00
Tue.	8	6.00	8 50	5.20	5.10
Wed.	9	6.00	9.50	5.20	5.10
Thu.	10	6.00	10.50	5.20	5.10
Fri.	11	6.00 LQ	12.00 AM	5.20	5.10
Sat.	12	6.00	1.20	5.20	5.10
Sun.	13	5.50	2.30	5.20	5.10
Mon.	14	5.50	5.10	5.20	5.10
Tue.	15	5.50	5.10	5.10	5.20
Wed.	16	5.50	5.10	5.10	5.20
Thu.	17	5.50 NM	5.10	5.10	5.20
Fri.	18	5.50	5.10	5.10	5.20
Sat.	19	5.50	5.10	5.10	5.20
Sun.	20	5.40	5.20	5.10	5.20
Mon.	21	5.40	5.20	5.10	5.20
Tue.	22	7.10	5.20	5.00	5.30
Wed.	23	8.20	5.20	5.00	5.30
Thu.	24	9.20	5.20	5.00	5.30
Fri.	25	10.20 FQ	5.20	5.00	5.30
Sat.	26	11.30	5.20	5.00	5.30
Sun.	27	12.30 AM	5.30	5.00	5.30
Mon.	28	1.30	5.30	5.00	5.30
Tue.	29	2.30	5.30	4.45	5.35
Wed.	30	3.30	5.30	4.45	5.35
Thu.	31	4.30	5.30	4.45	5.35

TOTAL HOURS LIGHTING DURING 1895.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	237.00	January	423.20
February	196.40	February	355.25
March	195.50	March	355.35
April	165.30	April	298.50
May	153.40	May	264.50
June	138.20	June	234.25
July	146.30	July	243.45
August	152.50	August	280.25
September	165.10	September	321.15
October	186.10	October	374.30
November	204.10	November	401.40
December	219.30	December	433.45
Total, yr.	2161.20	Total, yr.	3987.45





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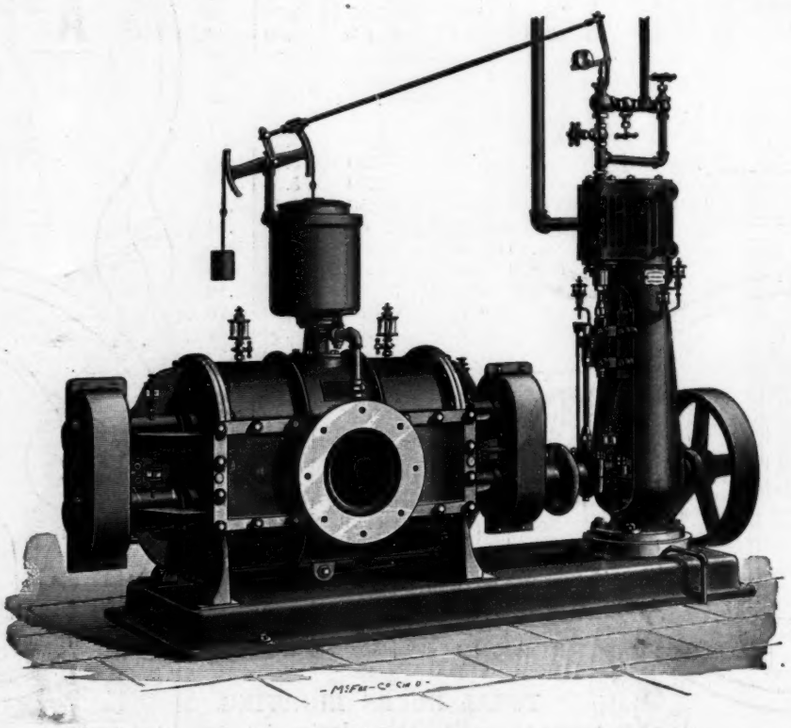

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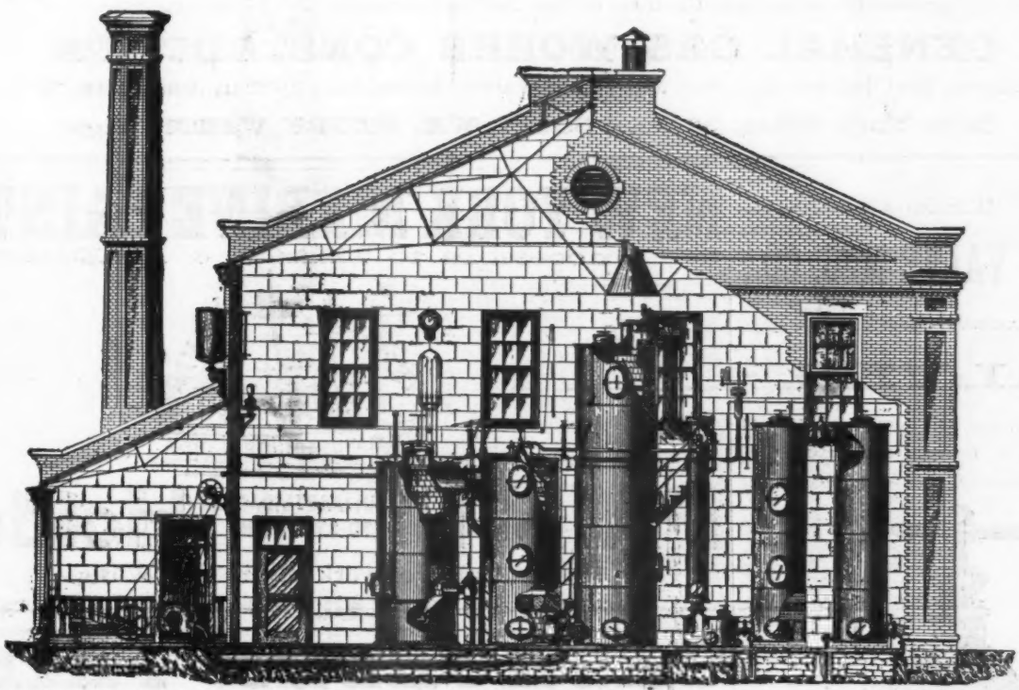

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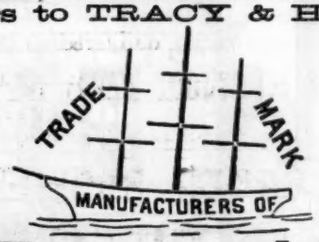

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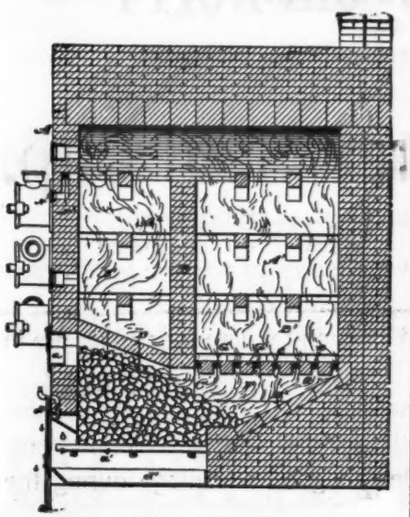

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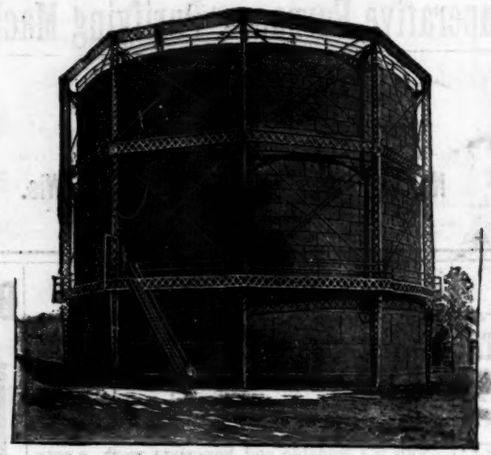

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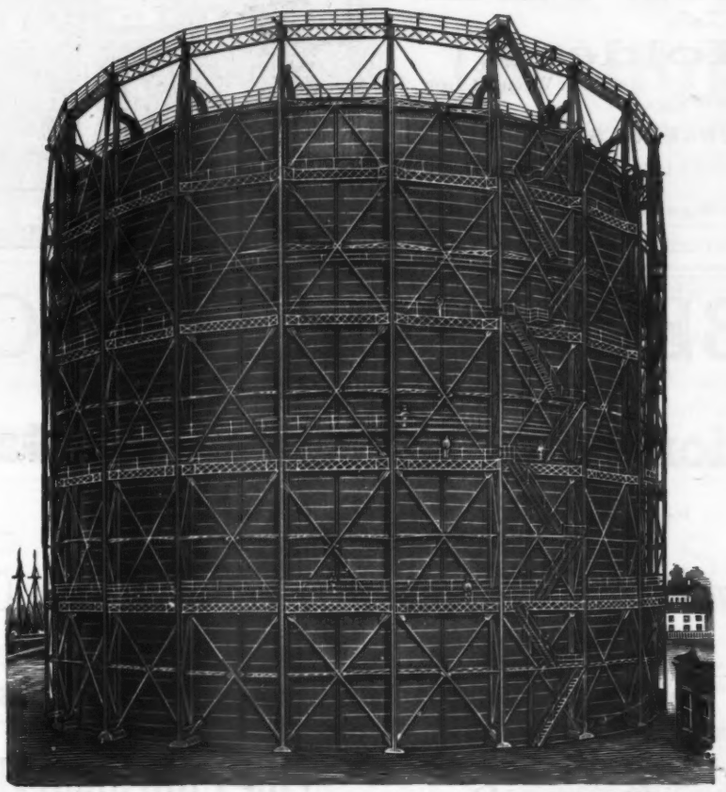

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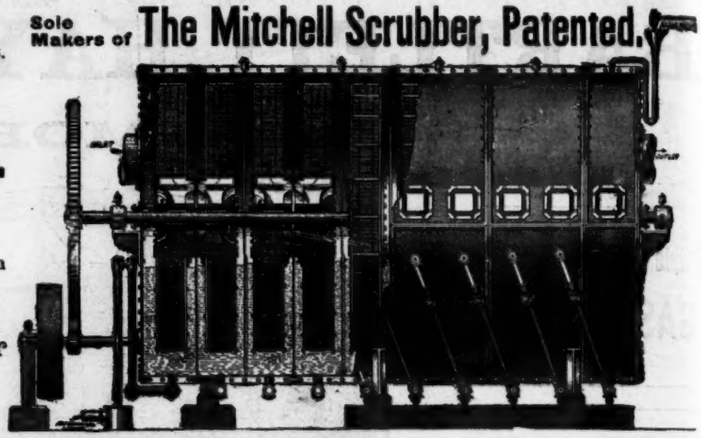

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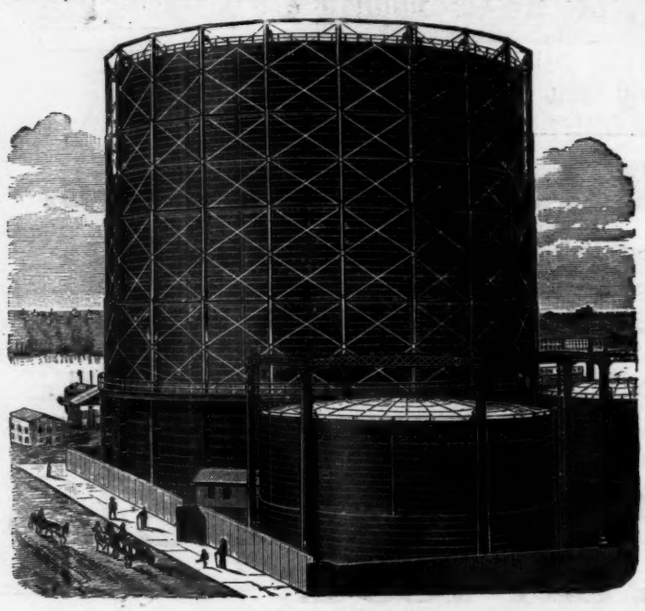

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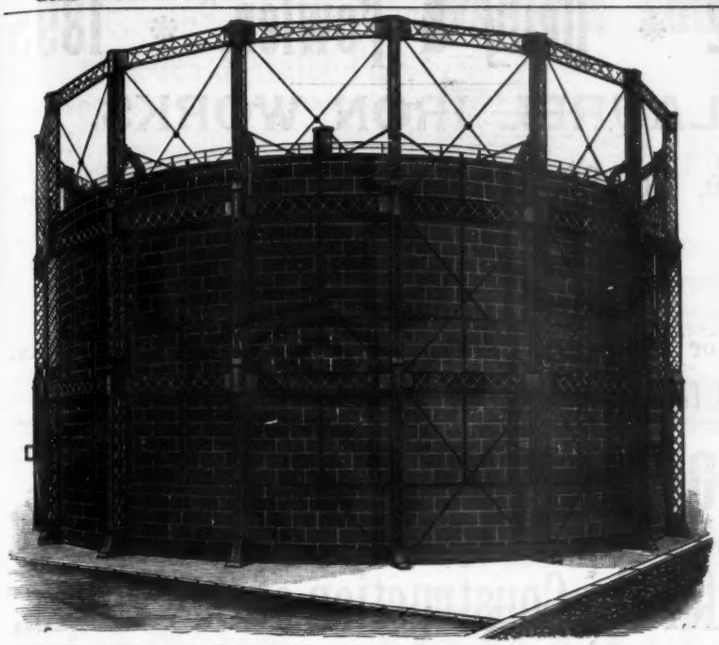

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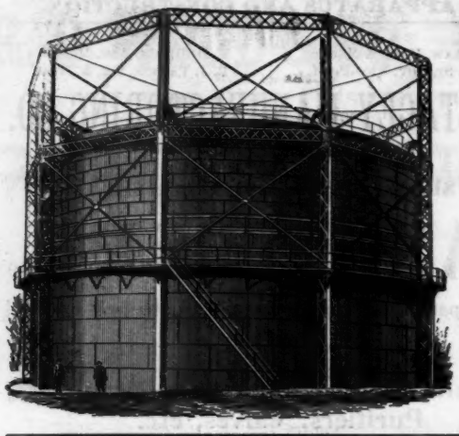

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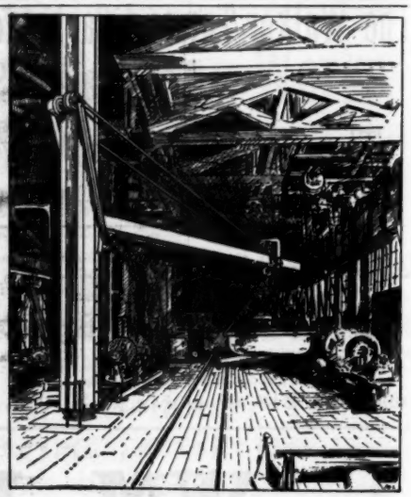

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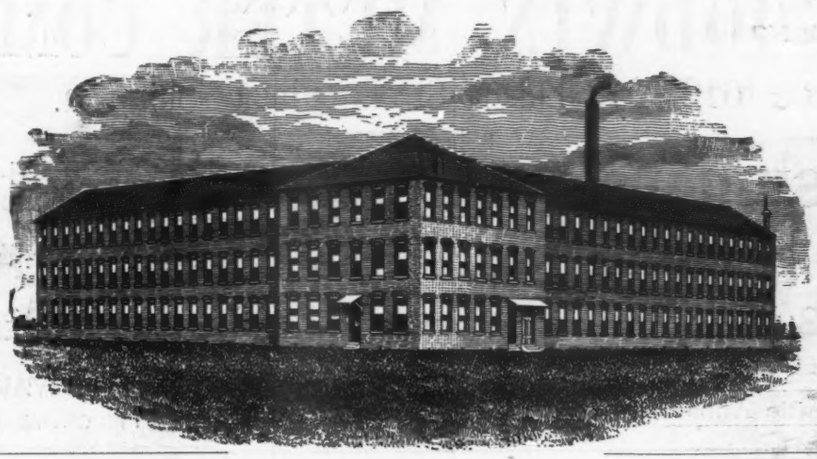

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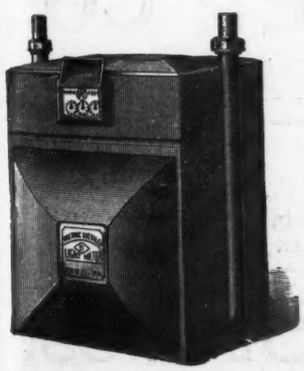

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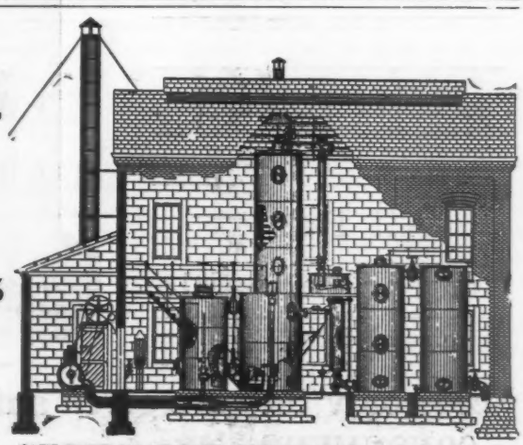

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